International edition

DRAGON USER

The independent Dragon magazine

60p US$2.60 September 1983

Getting better sound and graphics

Word processing software test

Disassembly introduced

Building an interface

Dragon in the US



WIN
A £150 speech synthesis package from Cotswold Computers and DRG Business Machines



MY NAME IS DIAMOND, DAN DIAMOND I'M A PRIVATE COP. I WORK THE BIG APPLE A SEETHING METROPOLIS FILLED WITH HUMAN MISERY AND CHINESE TAKEAWAYS.
NORMALLY I ONLY DO ROUTINE DIVORCE CASES BUT WHEN SHE WALKED INTO MY OFFICE I FOUND MYSELF INOLVED IN A CASE SO STRANGE THAT
IT MADE THE BIG SLEEP LOOK LIKE A CAT NAP...
HUNT WINS GRAND PRIX
At yesterday's Monaco Grand Prix, a hunting party strayed onto the track at the climax of the race. Cars were halted as the hounds rampaged around the circuit. "The whole place has gone to the dogs," one driver was reported as saying. The race was restarted; riders and drivers battled bitterly around the course before the Hunt thundered past the finishing line to take the chequered flag (it hasn't been seen since).
PLAYER WINS OPEN
Eagle eyed spectators were privileged to see
Salamander SOFTWARE
GSH Guild of Software Houses
17 · NORFOLK ROAD · BRIGHTON · BN1 4AA · SAE FOR FULL CATALOGUE
PRIVATE DETECTIVE DISAPPEARS
Police are baffled by the disappearance of Dan Diamond. He was last seen approaching the eerie edifice known as Franklin's Tomb, but the authorities are completely unable to find any trace of him. Citizens are asked to report any information relating to his disappearance immediately. For further details, buy FRANKLINS TOMB, a new adventure game for the DRAGON 32 and 48k ORIC-1. This adventure comes complete with a 24-page illustrated Case File. £9.95 from BOOTS, SPECTRUM, COMPUTERS FOR ALL, WEBSTERS and all other purveyors
BANANA DICTATOR SLIPS UP
2 DEAD IN EVEREST TRAGEDY
The Everest Expedition ended in tragedy yesterday as Carl and Fred plunged down a crevice to a grisly death. Hank the expedition leader was quoted as saying "Yuk". Continued on page
COLD WAR ON XARG ESCALAT
Thousands dead in Ice Storm
Muduras the Mud yesterday

DRAGON USER

September 1983

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How to submit articles

The quality of the material we can publish in *Dragon User* each month will, to a very great extend, depend on the quality of the discoveries that you can make with your Dragon. The Dragon 32 computer was launched on to the market with a powerful version of Basic, but with very poor documentation.

Every one of us who uses a Dragon will be able to discover new tricks and quirks almost every day. To help other Dragon users keep up with the speed of the development each of us must assume that we made the discovery first — that means writing it down and passing it on to others.

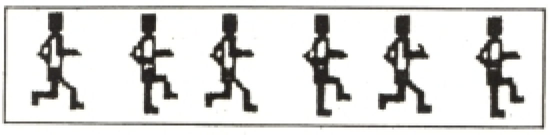
Articles which are submitted to *Dragon User* for publication should not be more than 3000 words long. All submissions should be typed. Please leave wide margins and a double space between each line. Programs should, whenever possible, be computer printed on plain white paper and be accompanied by a tape of the program.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your program returned you must include a stamped, addressed envelope.

We pay for articles according to the length and the quality — it is worth making that extra bit of effort.

Contents

SUNSHINE



Editorial

THE ARRIVAL THIS SUMMER of Dragon Data's disk drive system and Sinclair's Microdrive brought an end to one of the longest and slowest races in home computing. If you had held your breath waiting for the arrival of either then you would not have been around to see them cross the finishing line — long ago you would have been carried away prostrate and red-faced, perhaps only breaking silence at the end to mutter about "coming soon" being the micro industry's equivalent to "free drinks tomorrow".

Many users who did not have to be carried away had also lost interest in this marathon race long ago. Doubtless their interest will be revived by the actual arrival of the systems, although the Microdrive is not available in the shops yet. But the time it has taken two of the UK's biggest home computer manufacturers to make good their promises raises questions about their abilities to keep to schedule. The American side of the US Dragon venture is already promising advanced operating systems and 128s this year while the UK waits, less than patiently in many instances, for 64K of "official" memory. The Dragon 32 was not announced until it was ready. Doubtless Dragon Data wishes it had done the same for its drives — so don't interpret silence from the company as indicating a lack of activity, it's only that reticence may now be the preferred policy.

At least the wait is providing chances to smaller companies offering memory upgrades and disk drive systems. Premier Microsystems, in particular, has profited from the delays at Dragon Data — not just in terms of money but in enjoyment as well. The sound of arcade games in use could not drown the laughter coming from that company's stand at the London Computer Fair earlier this year. The "joke" was Dragon Data continuing to struggle with a problem on its drives which Premier had long ago solved. Many users find it harder to detect the humour in the situation, and it is unlikely that the belated arrival of the "official" memory systems will erase the memory of the time spent waiting.

● WHEN YOU CAN'T WALK across the office without banging your arms or legs against Dragons, peripherals or software waiting for review there's only one solution — not amputation but new offices. *Dragon User* has moved to 12/13 Little Newport Street, London WC2R 3LD. The phone numbers printed elsewhere on this page are now the correct ones on which to call us.

COMPUSENSE

Software for Dragon 32

BARCLAYCARD VISA

PO BOX 169, PALMERS GREEN, LONDON N13 5XA
Telephone: 01-882 0681 (24 Hr) and 01-882 6936
Offices at 286D Green Lanes (9.45-6.00 Mon-Fri)

Access

EDIT +

FULL SCREEN EDITOR and PROGRAMMER'S TOOL KIT £34.50
Available now — upgrade from HI-RES £12.20 plus SAE or 50p P&P
A super full screen editor, with HI-RES, on one cartridge. Your BASIC program can be readily changed by overtyping, inserting or deleting characters. Also included are powerful and easy to use functions for: FIND STRING, CHANGE STRING, COPY TEXT, SCROLL UP and DOWN, GOTO SPECIFIED LINE and ENTER ANY BASIC COMMAND eg. RENUM, DEL, CLOAD, CSAVE, NEW and RUN (that's how we did the screen dump). The FIND, CHANGE and BASIC commands are remembered and can be edited.
An extremely useful and powerful utility for the novice and the expert and very easy to use. Over 22,000 bytes still available for programs.

```
RUN
=====*** START OF TEXT ***
00010 REM
00020 REM >>> EDIT+ THE FULL SCREEN EDITOR <<<
00030 REM     ===========================
00040 REM
00050 REM          from COMPUSENSE
00060 REM
00070 REM dump HI-RES screen to EPSON FX-80 printer
00080 REM
00090 REM run from EDIT+ to dump actual screen
00100 REM
00110 REM SET LINE SPACING TO 1/9TH INCH
00120 PRINT#-2,CHR$(27);"A";CHR$(8)
00130 FOR I=0 TO 31
00140 PRINT#-2,CHR$(27);"K";CHR$(192);CHR$(0);
00150 K=&H600+I+191*32
00160 FORJ=0 TO 191:PRINT#-2,CHR$(PEEK(K));:K=K-32:
NEXT J
00170 PRINT#-2:NEXT I
00180 REM RESET 1/6 INCH LINE SPACING
00190 PRINT#-2,CHR$(27);"A";CHR$(12)
00200 PRINT#-2:PRINT#-2:END
=====***  END OF TEXT  ***
```

HI-RES

Upgrade to a 51 by 24 display **cartridge £25.30**
Just plug this cartridge into your DRAGON, switch on and you have a 51 column by 24 line display with true lowercase characters. This amazing software uses the high resolution mode to draw the characters on the screen and allows you to use BASIC almost as normal. In fact there are a number of extensions to BASIC to allow you to use the many additional features:

- ★ Mix graphics and text on the same screen
- ★ Select any of nine standard ASCII character sets for FRENCH, SPANISH, GERMAN, ITALIAN, BRITISH, USA, SWEDISH, DANISH or JAPANESE
- ★ Redefine any of the 244 characters
- ★ SPRITE GRAPHICS MODE enables any character to be an 8 by 8 dot Sprite
- ★ A most responsive keyboard with AUTO-REPEAT
- ★ Extra shift gives the missing characters on the DRAGON keyboard
- ★ Leaves about 19,500 bytes for BASIC
- ★ Switch between HI-RES and normal modes at any time
- ★ BLACK on GREEN, BLACK on WHITE, GREEN on BLACK or WHITE on BLACK
- ★ 32 by 16 compatibility mode for existing programs

Hi-res is a must for serious programming.

DASM/DEMON

cartridge £30.45
Combines DEMON and DASM in one cartridge. The ideal combination for developing machine code programs on the DRAGON.

DECODE

BASIC Converter **cartridge £18.95**
DECODE converts BASIC programs between TANDY COLOR format and DRAGON 32 format. Simply CLOAD the "foreign" program from tape. EXEC the cartridge and the program is converted. The same cartridge will work on a DRAGON 32 and a TANDY COLOR (Extended BASIC).

COMING SOON – COMPUSENSE SOURCE TAPES FOR DASM ASSEMBLER
VOL. I — SINGLE PASS DISASSEMBLER **£5.99**
Includes commented source and object code. Others to follow — send SAE for list.

DASM

An easy-to-use 6800 machine code assembler **cartridge £18.95**

- ★ Specially designed for convenient use on the DRAGON
- ★ Does not use a separate editor
- ★ Ideal for producing machine code routines to be called from BASIC
- ★ Includes a 6800 Reference Card

Type your assembler program just as you would a BASIC program and use BASIC to call DASM. When DASM has assembled your program it returns to BASIC where you can check for errors and execute the program immediately if required. The source program is saved and loaded using the normal CSAVE/CLOAD. The assembled program may be saved to tape using CSAVEM (this can easily be done automatically in BASIC when the assembly has finished).
DASM is a two-pass symbolic assembler which allows labels of any length (the first five characters and the last character are used). All the 6800 mnemonics and addressing modes are supported plus comprehensive assembler directives for defining constants, reserving memory, directing output to screen or printer. Errors detected by DASM are reported with easy to understand text messages.

DEMON

Machine Code MONITOR **cartridge £18.95**
DEMON gives you access to the inside of your computer. It features a real time display of memory locations in both hexadecimal and alphanumeric codes, a full screen editor for memory and register contents and multiple breakpoints. There are 12 commands designed to assist in debugging and running machine code programs (or BASIC programs with PEEK and POKE).
DEMON, unlike inferior products, has its own documented input and output routines which means that it does not interfere with BASIC. DEMON can be called from a BASIC program and will return control to the BASIC program. A user manual and a 6800 Reference Card are included.

BOOKS NOW IN STOCK

The Working Dragon 32	£5.95
Programming the 6809 (Zaks)	£12.50
Enter the Dragon	£5.95
The MC6809 Cookbook (Warren)	£6.25

Postage on books: add 50p per book — maximum charge £1.00
Zaks £1.00 P&P

We support our software!

Send SAE for details of our current upgrade details for cartridge software. This service is available direct from Compusense.

SEND LARGE SAE FOR OUR LATEST CATALOGUE

DUST COVER for the DRAGON **incl P&P £2.99**
A top quality tailor-made cover with cloth-bound edges to protect your computer.

LIMITED SPECIAL OFFER: a free dust cover with orders over £50.00

DISKS for the DRAGON: DELTA CONTROLLER £99.95 plus £2.00 P&P
DELTA 1 £299.95   DELTA 2 £349.95 plus £4.50 P&P

Top Quality WABASH 5.25 DISKETTES — 10 for only £17.95 inc P&P
5.25 Disk Cleaning Kit £17.99 inc P&P

PRINTERS and cables — please phone for keenest prices

ALL PRICES INCLUDE VAT

FAST MAIL ORDER SERVICE – please add 50p P&P on cartridges – or ask your local Dealer

This is the chance to air your views — send your tips, compliments and complaints to Letters Page, *Dragon User*, 12-13 Little Newport Street, London WC2R 3LD.

Letters

Handicap plea

THROUGH THE pages of your magazine I would like to contact other Dragon users with handicapped children.

Having seen some very good software suitable for ESN(S) children on a BBC B computer it convinces me the Dragon can do just as well.

I have started writing some very simple programs for my 10-year-old mentally handicapped son — and I am sure there must be a Dragon owner somewhere with more knowledge of programming than I.

Bryony Glass, Westbury, Wilts.

Millipede change

I TRIED out the Millipede program written by Keith Hunniford in your June issue. On running the program I found that an improvement would be a pause after the message "You ate a slug pellet, you are dead".

My suggested amendment is to line 350. Before GOTO 140 insert FOR N=1 TO 1000: NEXT N: giving you enough time to read the caption.

Jim Thompson, Frimley, Surrey.

Killing a bug

IN THE June issue in the article comparing the Dragon and the Tandy Color Computer it said there is a bug in the Dragon ROM which stops you from using USR machine code calls properly and that you have to redefine each address before calling it.

In fact you can use the USR function normally provided you make your USR call two digits, eg 05, 04.

Some examples:

```
10 DEFUSR0 = 32000:
   DEFUSR2 = 32500:
   DEFUSR5 = 32700
20 A = USR0(0)
30 B = USR02(X)
40 C = USR05(Z)
```

I hope you find this useful as it makes using machine code routines much easier and provided you put the '0' in front of the digit if greater than zero the correct call is made. But don't put a '0' in front when defining the address or you'll get the dreaded SN error.

Robert Westwood, Birmingham.

Getting it right

THE ARTICLE "Getting to grips with Dragon input and output" in your July issue contained a number of errors. Perhaps the following will go some way to help people who have been misled by it:

(1) The triggering of the cassette relay is not related to any interrupt handling.

(2) There is no such thing as a "printer relay" in the Dragon: bit 0 of address FF21 is in fact the printer "acknowledge" input line, and although not handled by the Dragon operating system, it can be used by other software.

(3) DDR-B of PIA-0 is always configured as *output*. Reading of the keyboard is achieved by *outputting* column selection data via FF02 and then reading the returned row data via FF00.

(4) The value of the joystick comparator is not as simple as suggested. It in fact represents the result of the comparison between the current value that has been output to the D-A converter, and the value given by the joystick reading that is currently selected via the MUX. MUX selection is determined by signals output on the CA2 and CB2 lines from PIA-0. This also determines which sound source will be directed to the TV.

M J Kerry, Seaford, East Sussex.

Pal for Dragon

I AM a shade surprised that your July review of printers failed to mention one low-priced machine that works well with the Dragon, the Microline 80.

The current cost is about £230 including VAT and though it has limitations it has much to recommend it.

The great advantages are that it is a sturdy, workmanlike machine with a high reputation for reliability. Once set up properly it carries on without giving trouble. It is capable of three sizes of print (set with PRINT#−2, CHR$(29, 30 & 31), though as the print head has only six hammers it has no descenders. There are machines with better type, but it is quite legible.

The paper may be fed with either roller or tractor feed — it works equally well with either. And it is possible to get an addition which allows for narrow tractor rolls to be used — for labels and the like.

Martin Bennett, London W1.

Saving solution 1...

P A LOW MAY be experiencing the same problems I had trying to save and load programs with the Dragon 32.

Using a Ferguson 3T07 recorder I found that having saved a program the volume control had no tolerance in its setting when reloading.

This problem was eventually solved when I changed the plug on the save lead and saved via the play/rec DIN socket rather than the microphone socket. Connect signal to pins 1 and 4 and screen to pin 2.

I can only assume that the output from the Dragon while saving was overloading the microphone input stage of the recorder.

Brian Beesley, Bishopstoke, Eastleigh, Hants.

. . . and 2

I ALSO have had problems in saving programs from the Dragon 32.

The output from the Dragon is high and the auxiliary input of the recorder must be used, not MIC input. Even if the auxiliary input is used the high level can cause a drop in level during the first few bytes of header producing an I/O error.

The problem is the auto record level on some recorders which overcorrects producing this effect.

I overcame this problem by fitting a 100K ohms potentiometer between the Dragon and the recorder, and adjusting the level until the recorder input is just below the operating level of the auto record level circuit. Some trial and error is required to obtain the correct level, but once set perfect saving of programs results every time.

Mark Greenall, Thornton Cleveleys, Blackpool, Lancs.

Graphics hint

THE DRAGON uses memory locations 1536 to 13823 which ends on page 8 of the memory location. By using POKE M, G, in the program, you can get in mode 3 or 1 255 different easy graphic blocks. This also allows you to use more than the set of four colours in either mode stated. This will help users to overcome the poor graphic set in text mode.

```
10 P.C.L.S
20 P MODE 1: SCREEN 1,1
30 M = 1536: G = 1
40 POKE M, G
50 G = G+1: M = M+8
60 IF G = 255 THEN 60
70 GO TO 40
```

Martin Entwisle, Farnworth, Lancs.

Software Top 10

1	(—)	**Mountain**	Dragon Data
2	(—)	**Basic Tutorial**	Ampalsoft
3	(—)	**Personal Finance**	Dragon Data
4	(—)	**Special Collection 1**	Dragon Data
5	(1)	**The King**	Microdeal
6	(5)	**Space War**	Microdeal
7	(—)	**Android Attack**	Microdeal
8	(3)	**Nightflight**	Salamander
9	(—)	**Planet Invasion**	Microdeal
10	(7)	**Katerpillar Attack**	Microdeal

Chart compiled by Boots

Moscow calling all Dragons

A SUSSEX firm has good news for any Dragon owners who are amateur radio enthusiasts — or who just fancy listening to the Russian news service.

M Kerry's RTTY program enables the Dragon to send and receive radio teleprinter signals used by radio amateurs and many commercial news sources, including the Russian news agency Tass.

This program is capable of decoding RTTY signals from audio tones which are fed from an extension speaker point on a user's short-wave or VHF receiver straight into the Dragon's cassette input.

Alternatively, the program can be supplied in a ROM cartridge which plugs into the expansion socket on the Dragon. This costs £21 and has space for a second 4K EPROM. The cassette version costs £12.

M Kerry can be reached at 22 Grosvenor Road, Seaford, Sussex.

Tandy converter comes on cassette

EASIER MONITORING of machine code and conversion of Tandy Colour Computer programs are promised by two new packages.

The latest machine code monitor is from KayJay Electronic Services which normally covers hardware and industrial electronics. Including a disassembler, Dismon costs £18.86. KayJay is on (0493) 667086.

Elkan Electronics thinks that its Dragon Cruncher is the first cassette-based, menu-driven program for converting Tandy Colour Computer programs for use on the Dragon. It costs £7.95.

Dragon Cruncher converts most programs and Elkan is working on a machine code converter for the rest. The company is on (061) 798 7613.

Memory added to business system

THE HUMBLE Dragon 32, plus 16K of memory, is ready for the world of business computing, as part of a new accounting system designed for the independent retailer by Halsel Retail Systems.

The Halsel Retailer, as the system is called, incorporates a Dragon 32 (specially modified to 48K), a screen, a cassette recorder and a printer in one unit.

The use of a home computer like the Dragon in the system is an attempt to simplify small business computing.

Says Peter Selby of Halsel: "We wanted to provide a complete unit which can be simply plugged in and operated without the user needing an engineering degree to connect all the bits together."

Programs for the system, which come in cartridge form, provide the retailer with what is claimed to be a quick and easy way to do the book-keeping. They can provide information for profitability analysis, stock investment, expense analysis and bank account and supplier account records. VAT returns are produced automatically.

Bid Horace and Atari welcome

ATARI AND Melbourne House's Horace are entering the Dragon software market while already established Wintersoft is extending its range.

Micro manufacturer Atari, whose best-selling games include the original Pacman and Centipede, is converting its software to run on the Dragon.

Melbourne House is doing the same for Horace and Wintersoft is continuing its saga of the Ring of Darkness.

Hôrace moves over from the Spectrum this month. Hungry Horace is the first conversion, available at £5.95. Horace goes Ski-ing and Horace and the Spiders follow next month at the same price.

Once the Dragon 64 is available, The Hobbit may also be converted. At the moment memory restrictions are the problem.

Melbourne House is on 01-977 9160.

In addition to its follow-up to the Ring, Wintersoft is also releasing an arcade adventure entitled Operation Gremlin. In this a player controls eight different characters (Captain Bono and his crack squad) in a bid to save an evacuated space city.

Wintersoft has moved recently — to Uplands Park Road, Enfield, Middlesex. Its new telephone number is 01-367 5720.



Wintersoft's Dave Briskham and John Humphreys – adding to the Ring

Joystick choice widens

DRAGON OWNERS who want to add a joystick to their computer now have two more models to choose from.

American company Spectrum Projects is aiming at those users who wish to share their computer games with a friend. It is marketing a double stick interface which allows you to hook-up two Atari-type joysticks for use on your Dragon.

The interface by itself will cost UK residents $US29.95.. Or, for $US49.95, you can get the interface with two Atari joysticks. Orders should be sent to Spectrum Projects, 93-15 86th Drive, Woodhaven, New York 11421.

Closer to home, Manchester-based Elkan Electronics has what can be described as a "deluxe" joystick on the market.

Called the Quickshot, Elkan's joystick boasts a handle contoured to fit the shape of the hand, two firing buttons (a "deluxe" button on top of the stick and a "conventional" button on the base), and a rubber suction cup on the bottom to give added stability for one-handed operation.

It also has a four-foot long cord and can plug straight into the Dragon 32 or a Tandy Colour Computer.

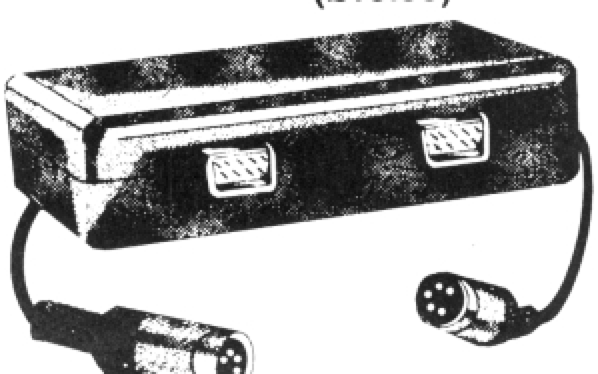
The Quickshot sells at £14.95 plus £1 post and packing or you can get a pair for £28.95 plus £1.50 post and packing. Elkan Electronics can bé contacted on (061) 798 7613.



Now you can hookup two Atari* type digital joysticks to your DRAGON32 or Tandy Colour Computer for true competition feel and action with the

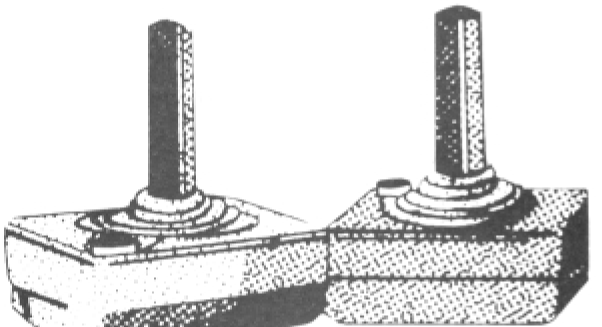
DOUBLE DOUBLE STICK* INTERFACE

for only $29.95.
(£19.95)



ALL PRICES IN U.S. DOLLARS AND INCLUDE POST/PACKING AND INSURANCE.

$49.95 – The interface with two Atari* joysticks



* Interface made by WICO. Atari is a registered trademark of Atari, Inc.

YES! Please send :

( ) INTERFACEs... $29.95
( ) STICK/INTERFACE SETs... $49.95

I enclose a Postal Order in US funds for $.............

NAME ____________________

ADDRESS ____________________

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POST CODE ____________________

SPECTRUM PROJECTS
93–15 86th DRIVE • WOODHAVEN, NY 11421 USA

Datapen promises control

A NEW light-pen claimed to give the operator greater control over data capture is now available for the Dragon 32.

The light-pen, which is being manufactured by the newly-formed Datapen Microtechnology, costs £25.

Datapen's sales director, Pam Rayner, feels the pen is superior to others on the market.

"Most light-pens on the market are difficult to use because the operator has little or no control over the pen's data capture as the pen approaches the screen," she said. "Our light-pen has a LED readout showing that data is available and a switch built into the casing that allows the operator to signal when the position is right."

Datapen is including a range of software with each light-pen. In addition to user routines and example programs there is also a freehand drawing program.

Datapen can be contacted on (0256) 770488.



Datapen's light-pen – with LED readout and built-in switch

Software firms hit hitches with Dragon Data

TWO SOFTWARE houses disappointed by negotiations with Dragon Data are warning others not to let their hopes rise too high.

Dragon Data discussed the possibility of marketing software from the two firms, Windrush Micro Systems and MST Consultants, but eventually decided against it.

The time Dragon Data took to reach this decision has not impressed either software house. Both also argue that they were given a more optimistic impression by the actual negotiations.

Dragon Data argues that these two cases are exceptions, being the only negotiations which looked favourable but did not turn out so in the end.

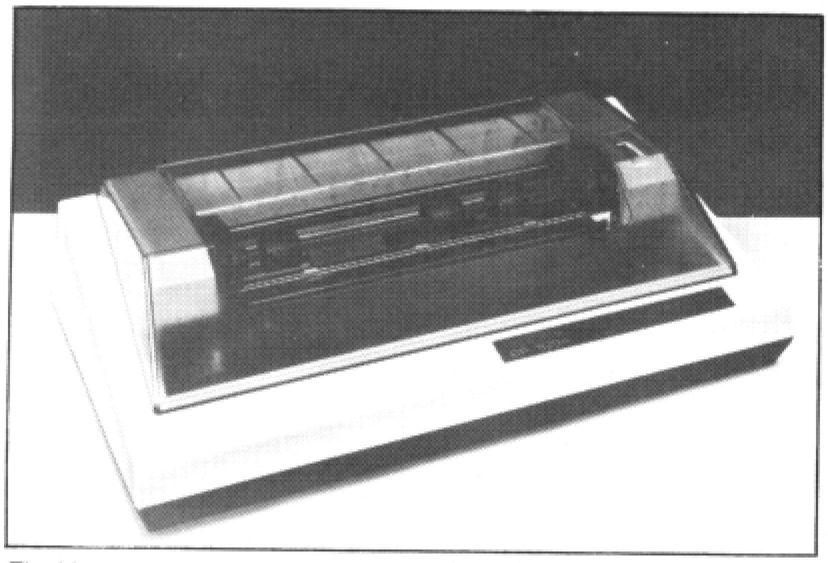
In other cases, the company says, negotiations have ended favourably for the software houses involved and their products.

Peter Crane, of Devon-based MST which produces business software, says that he felt deflated, "having been taken to the top of a high mountain and shown the world".

His regret is that while negotiating with Dragon Data he stopped pursuing other outlets for his products.

Peter's talks with Dragon Data spread over three months, while Windrush's, centring on its Mace editor/assembler/monitor, took two months longer.

Windrush's Bill Dickinson cut back promotion of Mace during negotiations. He now thinks "the answer is to carry on marketing until you've got a signed contract".



The hi-res screen dump works on Seikosha and Tandy models

Packages focus on the hi-res screen

DRAGON OWNERS can now put text on to the high resolution screen, and then dump the contents to a printer using another package.

Mixing text with graphics is handled by Charset from ASN Computer Services. It also allows you to display your text forwards, backwards, diagonally, inverse, large, small and in other formats.

It costs £7.50 and comes on cassette. ASN is on 01-841 1507.

The high resolution screen dump program comes from Caveman Computers in Gateshead.

Another cassette, it costs £7.95 and needs a Tandy DMP 100 or Seikosha GP100 A printer.

Caveman Computers is at 55 Iona Road, Windy Nook, Gateshead, Tyne and Wear.

Cover-up begins for the Dragon

THE LATEST addition to the list of extras owners can buy for their Dragon is the computer cover. And already several companies have different versions on the market — ranging from simple dust covers to a carry case to protect the Dragon from hard knocks.

Jenart Trading is producing a carry and storage case specially designed for the Dragon 32.

The case is waterproof and made of heavy duty brown vinyl. To give extra protection to the Dragon it is lined and has reinforced edges. It can also hold the transformer and leads.

The case is normally priced at £10.95, but Jenart has an introductory offer of £9.95, providing the order is received by the end of October. Orders can be sent to Jenart Trading, 19 Spire Lake, Bishops Nympton, South Molton, Devon EX36 4NY.

For those who feel their Dragons need protection only from the dust there are also lightweight covers on the market. Compusense and Cotswold Computers are both producing plastic dust covers for the Dragon.

The Compusense version is light blue with a dark blue trim. Readers can order one by sending £2.99 to Compusense, 286D Green Lane, Palmers Green, London N13 5XA.

The company is also giving away one free cover with software orders over £50, but this offer only lasts until the end of October.

Cotswold Computers makes a similar dust cover, except that it's beige with a brown trim and has the word Dragon printed on it. It costs £3.50.

Cotswold Computers can be contacted on (0608) 737472.

Dragon Data offers a forum for users

This month we clear up a few questions surrounding the biggest Dragon club.

THE BIGGEST DRAGON Club, both in terms of members and puzzled letters we receive, is the one set up by the machine's manufacturer, Dragon Data.

One aim of the Dragon Users' Club is to help users form local clubs and pass on news of existing groups through its newsletter *Stop Press*, which is mailed out free to all members of the club. To receive copies of this newsletter all you have to do is fill in and return the warranty card which came with your Dragon. But Dragon Data points out that a lot of people have not so far registered in this way. The company adds: "If you know of anybody in this category, gently prod them to return their card so that future issues of *Stop Press* may be directed to them."

If you have returned your registration card and not heard anything yet, in the immortal words of *The Hitchhikers' Guide to the Galaxy*, "don't panic". The mailing list for each issue of *Stop Press* is prepared in advance of publication. This means that if you return your warranty card about the same time as an issue of *Stop Press* is released you will not get on to the mailing list in time to receive that issue. You should, of course, be okay for subsequent issues.

However, if you have still not received anything about eight weeks after returning your card, then write to Dragon Data with



Dragon Data – home of Stop Press

details (and proof of purchase if possible) and the company should then check that you are on the mailing list.

As with this magazine, the decision on how many copies to print of each issue is based partly on the number of people registered. This means that back issues of *Stop Press* are very hard to get hold of — so register as quickly as possible to avoid missing the ones to come.

Another thing to dc quickly, if you are trying to establish a users' group or have already set one up, is to write to *Stop Press*. Dragon Data wants to publish a complete list of such clubs in *Stop Press*: "In this way we can put other users in your area in touch with your club." By the end of this year the company expects to have sold more than 150,000 Dragons. If every buyer registers then the likelihood of establishing contact with nearby users will be high indeed.

Dragon Data wants to encourage the growth of such clubs but will not interfere with what users want to do: "Dragon Data does not intend to involve itself directly in the running of local clubs, believing it best left to the enthusiasm of their members." However, if you would like support material for club activities then write to Dragon Data outlining what you have in mind.

But *Stop Press* does a lot more than promote local user clubs. The first issue of the newsletter outlined its aims — "to help keep Dragon users informed of the very latest developments in Dragon technology, including the introduction of new peripherals, the latest on software releases and even the development of new Dragon computers".

Readers are invited to contribute programs, comments, suggestions, hints or stories. Dragon Data itself contributes advice — for example, the first issue of *Stop Press* offers some tips on cassette loading and saving with the Dragon. Two sections introduced in the second issue also appear in the third, Machine Code Corner and the Young User Pages, and Dragon Data hopes these will become regular features.

Many of the letters this magazine receives about the Dragon Users' Club and *Stop Press* have been prompted by the time it took Dragon Data to organise that end of its activities. People who bought their Dragons last year were none too pleased at the long wait before *Stop Press* was published this year. But now the newsletter is up and running, and getting bigger every issue.

Confusion between this magazine, which is an independent publication, and *Stop Press* has also been running high. This has not been helped by the fact that *Dragon User* is published by Sunshine Books, a trading name of Scot Press, which sounds suspiciously like *Stop Press* over the telephone.

One caller phoned these offices only to be told, to his understandable amazement, that we were not the Dragon Users' Club but that we are indeed Scot Press. To return that reader to sanity, and to reassure any others still perplexed, *Stop Press* can be contacted at Dragon Data, Kenfig Industrial Estate, Margam, Port Talbot, West Glamorgan.

Clubnet

Derbyshire: Dragon Owners' Club, Dragon Dungeon, PO Box 4, Ashbourne, Derbyshire — publishes *Dragon's Teeth.*

Devon: Ian Chipperfield, Brixham Dragon Owners' Club, 22 Brookdale Court, Brixham, Devon — meets every Saturday afternoon.

Dorset: Dragon 32 Users' Club, Games and Computers, 31 North Street, Wareham, Dorset — publishes newsletter.

Essex: Doug Bourne, Dragon Independent Owners' Association, School House, Nevern Road, Rayleigh, Essex — publishes *The Dragon's Tale.*

Lancashire: Melvin Franklin, North-West TRS-80 Users' Group, 40 Cowlees, Westhoughton, Bolton, Lancs — growing number of Dragon users, meets monthly at Irlam near Manchester and publishes newsletter.

London: 68 Micro Group, 41 Pebworth Road, Harrow, Middlesex — publishes *68 Microcosm* and meets on the fourth Tuesday throughout the year in the Regent's Park Library, Robert Street, London NW1, all 68XX owners welcome.

Staffordshire: Tony Beckedd, Tame Computer Club, 57 Adonis Close, Tamworth, Staffs — an all-user club including 15 Dragon owners, meets fortnightly.

Wiltshire: R Gould, 39 Cullerne Road, Stratton St Margaret, Swindon, Wilts — interested in forming Club 32.

Scotland: David Anderson, Scottish Dragon Club, 1 Walker Street, Edinburgh — regular newsletter.

South Africa: Ian McCall invites other SA Dragon owners to contact him at 35 Silwood Road, Rondebosch, Cape Town.

A look at the serious side of the Dragon

***John Scriven** takes a break from games to look at the more serious side of the Dragon.*

"WHY DID WE buy that computer, Horace?"

"So that little Jack and Jill could have a head start in life, dear."

"You mean, pushing them forward on the crest of the micro-technological revolution, so they'd be able to do well at school, and both get good jobs and keep us in our old age?"

"Yes, that's it exactly. Oh, and so that we needn't get left behind in the exciting, thrusting eighties."

"Well then, could you tell me something that's been worrying me?"

"Of course, my dear."

"If all that's true, then why did they spend the first three months after Christmas playing Galactic Super Zap, then lose interest?"

"Um, well . . ."

"And didn't you say your accountant wasn't impressed when you tried to tell him that your Stupendous Adventure cartridge was a justifiable business expense?"

"Um, well . . ."

After owning a computer for a few months, some people find that a constant diet of alien-crunching and avoiding angry gorillas begins to pall somewhat. Others, trapped in caverns measureless to man or pursued through ancient mansions long into the dark night, are pleased for any opportunity to escape into the fresh air. There are also those who want to justify the purchase of an expensive piece of equipment, and although the above scene is far-fetched (one hopes!), a computer is too versatile a machine to be restricted to any one use.

This month I have been looking at a selection of more serious uses to which a Dragon can be put. These can be divided into business uses, graphic design and program development. If you run a business yourself, then you are likely to own something rather more powerful than a Dragon to look after stock control, invoicing, etc. If your business is small, however, or you are just a home user, there are times when a word-processing facility would be a great help, if only to store a standard letter of apology to your bank manager.

A word processor (or WP) has to perform several tasks. Going far beyond an electric typewriter, it should be able to accept continuous typing, without the need to include line-feeds and carriage returns. Any words that are too long to appear at the end of one line should automatically be sent to the start of the next (automatic word-wrap). Mistakes, even in the middle of the text, need to be readily accessible for correction. Blocks of text may need to be deleted or moved, and it is a good idea if the text can appear on the screen in its final formated form, before being printed.

Under review

Telewriter £49.95	Microdeal, 41 Truro Road, St Austell, Cornwall
Textstar £12.95	Personal Software Services, 452 Stoney Stanton Road, Coventry
Editor £9.95	Microplot, 19 The Earls Croft, Cheylesmore, Coventry
Word Processor £17.25	Juniper Computing, 8 Pembroke Green, Lea, Malmesbury, Wilts
Hi-res £25.30	Compusense, PO Box 169, Green Lanes, Palmers Green, London
Artist's Designers £6.99	Wintersoft, 30 Upland Park Road, Enfield, Middlesex
Dasm/ Demon £30.45	Compusense, PO Box 169, Green Lanes, Palmers Green, London
Mace £29.95	Windrush Micro Systems, Worsted Laboratories, North Walsham, Norfolk

Above all, a word processor needs to be able to store text and save and load it from tape or disk.

Other features that are useful are right justification and proportional spacing, so that the words in each line are spread out to reach both left and right margins (as they do in this magazine). Line length and spacing should be easily altered, and any facilities on the printer such as different type fonts and double height letters should be easy to select.

The Dragon has several features that make it a good machine for word processing, and several that discourage its use in this area. The keyboard is obviously much better than those on computers with calculator style or rubber keys. What is less obvious is that the scanning routine is not up to very rapid key-presses, and odd letters tend to disappear when typed fast.

The Dragon does possess a built-in Centronics interface — the most common standard parallel printer connection — so it is easy to hook it up to the vast majority of printers on the market. This does, however, raise another point — printers that can produce reasonable quality on paper approximately A4 in size start at £200, which has to be added to the price of the WP package. There is little point in using such a package unless you can produce decent hard copy.

A further problem that occurs is with the display screen. The Dragon's standard text screen is 32 × 16, which is excellent for readability, but cannot duplicate the final appearance on paper, unless the character set is redefined to at least half its original size. Dedicated WPs have a screen display of 80 characters, which corresponds to standard small printer width.

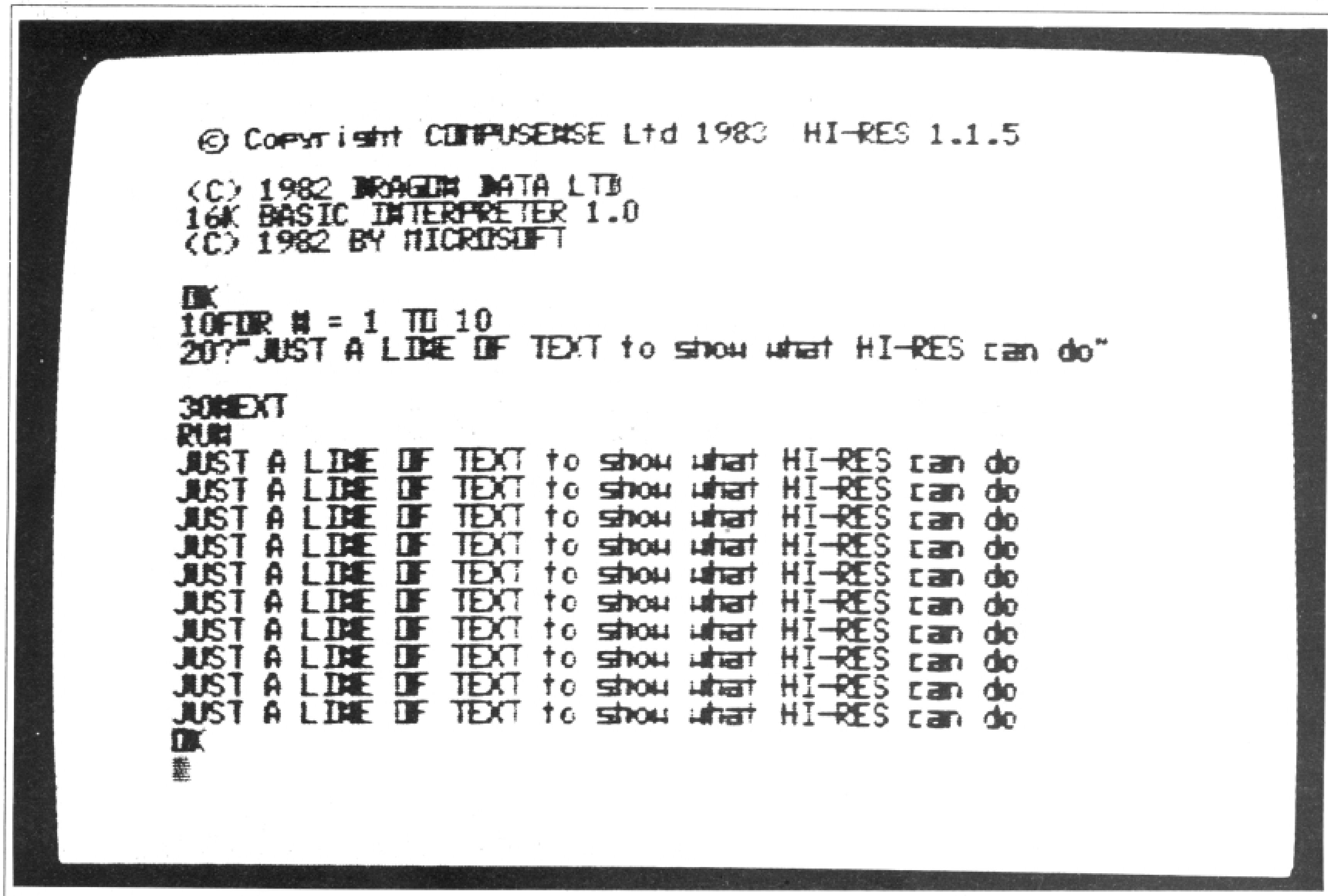
Lastly, of course, although the Dragon supplies the correct upper and lower case codes to a printer, it cannot produce small letters on the screen.

Packages

If you think I have shot down the Dragon before I have even started to consider the packages on offer, that is not the case. All computers in the sub £200 price bracket have deficiencies, and anyone expecting full professional facilities on one of them is deluding themselves. There are ways round some of these deficiencies and some of the packages have succeeded in producing what is a reasonable compromise.

The four packages I have been looking at vary considerably in price, and if you need a word processor, the best thing would be to try out each one to see if it offers exactly what you need.

Telewriter, from Microdeal, is the best documented, most comprehensive in terms of printers covered, and naturally, the most expensive at £49.95. Written originally for the Tandy Colour Computer in the States by Cognitec, it comes as an A4 stiff ring file, containing instructions and a manual. Almost dwarfed by the size of the container is a little pocket containing the cassette. This contains several versions of the program with demon- ▶



Compusense's Hi-res – a high resolution screen of 51 by 24, including redefined character sets making it easy to mix graphics and text

◀ stration texts. Each is suitable for a different range of printers (the reason for this is that although they may use standard interfaces, printers use different codes to control expanded text, underlining, etc).

To cope with the problem of unsuitable screen format and lack of lower case letters, the screen is redefined to allow 24 rows of 51 characters, and pressing SHIFT 0 gives true lower case on the screen. These letters are surprisingly clear in black on white. In fact, a higher resolution would not be clearly visible on a normal TV, and computers such as the BBC with 80 column modes are only really suited to monitor use when used in the highest resolution. Having 51 characters is just wide enough for word processing, if you want to examine the finished document on screen, but it does tend to produce a skinny letter. Longer lines are possible, but they aren't shown in their true format on the screen.

Typing irritation

My main irritation with an otherwise excellent program is common to all the WP packages, and is more to do with the keyboard scan than anything inherently wrong with the programs themselves. Every time I got into a typing rhythm, odd letters were missed out — and although I do a lot of typing, it's hardly done at a great speed.

Text Star from Personal Software Services and Microplot's Editor both have less than 2,000 words documentation, rather than the 30,000 or so with Telewriter. This means you have to experiment for a while to discover the full potential of these programs. In fact, they both bear the trademark Microplot, and were written by the same author. Both programs show a considerable resemblance to each other, even down to the idiosyncratic spelling of "curzor". Even though Editor is supposed to have been written more recently, I certainly didn't find it as user-friendly, making less use of menus, etc. Both take some time perusing the limited documentation to become familiar with their operation.

Traditional

Neither of the programs produces lower case characters or attempts to display text in anything but the traditional fashion, but both are capable of formatting a reasonable letter on the screen and printing it. They are equally suitable for editing Basic programs. If you save a Basic program by using CSAVE "PROG",A (thus saving it in ASCII format), it can be loaded into all of the programs reviewed so far, and edited on screen, a feature that the Dragon does not usually allow. If you don't own a printer, it would certainly make the programs a worthwhile consideration.

Juniper Computing's word processor is also cassette-based, but makes use of frequent menus to select the options. The documentation is clear and falls somewhere between the length of Microdeal and the other two programs. Although it is limited in its options compared to the other programs, it is the easiest to use and worked well with Microline, Seikosha and Epson printers.

While the Juniper version is easy to use, like Telewriter, it does seem to be slightly over-priced at £17.25. There is little to choose between Text Star and Microplot's WP. These certainly seem to offer the best value. If you need a high resolution mode to examine the final text on the screen, a detailed instruction course and can afford the expensive Microdeal package, then you will find versatility, exceptional documentation, and good screen display.

Graphics aids can vary from simple routines that draw designs on the screen up to complex computer aided design packages that will put predefined shapes anywhere on the screen and rotate and enlarge them. The two programs that I have been looking at both fall into the second category, although they work in different ways and achieve different effects.

Extensions

Hi-res from Compusense comes as a ROM cartridge. Rather than being simply a program that allows you to draw on the screen, it instead gives you extensions to the Basic drawing commands already available on the Dragon. This is carried out on a high-resolution screen of 51 by 24 (like Telewriter), and includes redefined character sets so it is easy to mix graphics and text. Provided the program is not too long, it is interesting to load other programs from cassette while Hi-res is plugged in, just to see if there is an improvement in

the screen display. The keyboard has also been re-configured so that extra characters can be accessed from the top row of keys by pressing CLEAR as an extra SHIFT key.

The documentation implies that there are 10 different sets lurking inside, and the European and US sets certainly appear as one would imagine, with accents, upside-down question marks, umlauts, etc. However, I felt a little cheated when I entered CLS 18 (selects Japanese character set) and discovered not a beautiful kanji character set, but the usual English set plus a lonely yen symbol — still, that would have been too much to ask!

If you aren't happy with the available characters, you can redefine your own on a four by eight matrix quite easily. As you can redefine the whole character set like this, there are over 200 new characters available. The documentation calls these "sprites", but they are not what Atari owners, for instance, would call sprites, and they cannot move in pseudo three dimensional space or do any of the usual sprite tricks. In spite of this, they are very useful in their own way as extensions to the usual graphics routines on the Dragon, and if you can afford the standard high cartridge price, then there is no doubt that Hi-res will add to the pictorial capabilities of your machine.

Advanced

Artist's Designer from Wintersoft is basically an advanced version of etch-a-sketch. It can draw lines, circles, boxes, ellipses and spokes, and you can PUT and GET shapes around the screen — in fact you have access to all the drawing commands that are available in Dragon Basic, but all obtainable directly by single key-presses, which makes the task very easy. It works in all the drawing modes and each time you need to make a choice, the text screen comes up with an easy-to-understand menu. When you have completed a picture, it can be saved to tape and reloaded at a later date. There is also a slide-show option so you can load a series of pictures from tape and display them in turn. If you need an easy way of drawing plans or designs, then this is the ideal program. Wintersoft itself uses this program to draw the starting frames in some of its other programs, and some examples are included on the cassette.

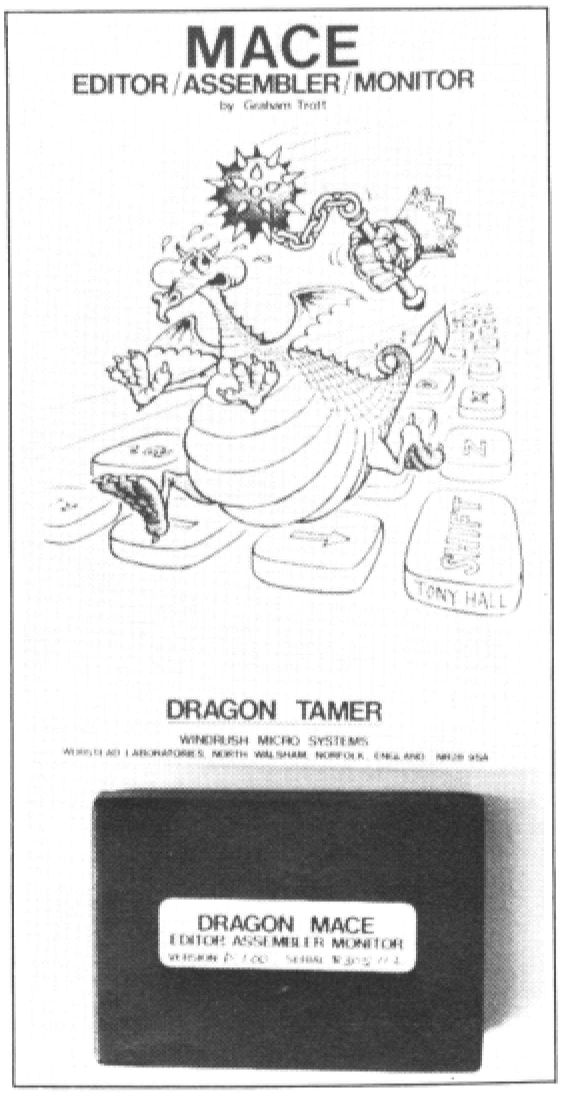
There comes a time when the speed and facilities offered by Dragon Basic no longer satisfy the programmer, and he or she wonders if it might not perhaps be worth the effort of learning to program in machine code, or at least to use machine code routines in Basic programs. Accessing the 6809E processor is easy on the Dragon, but simply entering line upon line of meaningless numbers is intimidating and time-consuming, so the first serious purchase after a book on 6809 machine code must of necessity be an assembler, with a disassembler and a machine-code monitor high on the list too.

All processors have instruction sets, a series of commands that tell them how to operate — in a way this is analagous to Basic keywords. The commands tell the processor to load several registers or temporary stores with various values, and these comands are different for each processor. Some computers, eg Commodore Pets, Vics and 64s, BBCs, Electrons, Apples and Orics, use the Rockwell 6502; Sinclairs, Lynx, Osborne, etc, use the Zilog Z80 series; but Dragons and the Tandy Colour Computer are the only domestic machines to use the Motorola 6809. This is not because the 6809 is inferior in any way — simply that it came onto the market more recently and has been mainly used for industrial and control applications. It has 59 basic op-codes, but these can be expanded in different addressing modes to make 1,464 instructions in all. In a limited way it approaches the power of a 16-bit processor, particularly as it has two 8-bit registers that can be used as one 16-bit accumulator.

Memory label

It would be impossible to remember the function of all the instruction codes, so each one is given a mnemonic, or memory label, eg the instruction ADDA(M) means "ADD Memory to accumulator A" which makes a lot more sense than &9B. The most interesting mnemonic in the 6809 is SEX which means "Sign EXchange register B into A" (used to convert 8-bit numbers into 16-bit numbers). This instruction does not exist in 6502 mnemonics, so it's quite true to say that you can't have SEX with an Apple, but you can with a Dragon(!).

You could enter the op-codes by hand, but easier than that is to use an assembler



Windrush's Mace – 20 editing options

and simply type in the mnemonics. Assemblers are programs that translate the mnemonics (the source program) into their binary equivalents (the object program). They can also usually let you assign names to various locations in memory as well as displaying your program in a neat form on the screen. A disassembler works in reverse, and a monitor/editor will allow you to look at a completed program and alter it.

Both Dasm/Demon from Compusense and Mace from Windrush Micro Systems come in the form of plug-in ROM cartridges. They are therefore far faster to set up and do not eat up so much valuable RAM in use, as do tape-based assemblers. The price of the two cartridges is similar.

Dasm, the assembler part of the package, performs its task perfectly well, and the documentation is comprehensive and clearly written. Dasm uses 16 assembler directives (extra instructions to make assembly easier) and can assemble to the screen or to a printer and save the resulting program on cassette. There are nine error messages if your source program fails to assemble at the second pass. A problem occurs not when your program is bug-free and assembles correctly, but when it fails to do what was intended. You need the monitor part, Demon, with a breakpoint facility to check each section is performing as it should.

Mace

The documentation for Mace is 80 pages long. Apart from general instructions, it gives a detailed breakdown of the 6809 instruction set, use of interrupts, and monitor and editor commands as well as examples. On plugging in, switching on, and entering EXEC 49152, you are in editor mode. This gives you 20 options, including insertion and deletion of program lines, search and replace strings, load and save from tape, edit, assemble, go to system monitor or exit to Basic. There are 14 assembler directives and 14 assembly error messages, and the monitor allows breakpoints and jumps to sub-routines, both vital to final de-bugging.

If you intend to purchase either cartridge, then it is well to remember that neither of the accompanying booklets attempts to teach you assembly programming. For this, you will need a copy of either Lance Leventhal's *6809 Assembly Language Programming* or Rodnay Zaks' *Programming the 6809*. Naturally enough, the articles in *Dragon User* on machine code programming will prove a useful baptism in this difficult, but useful area.

Those of you that are arcade addicts may feel rather left out this month, but I shall be reporting on your favourite diet again next month, along with any other new software that comes my way. If you feel too left out, you could always spend the next month learning machine code and graphics techniques, then documenting it on a word processing package, finally producing your own high-speed arcade game! ■

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Headquarters of Tano, the American corporation responsible for the manufacture and distribution of the Dragon 64 in the US

Dragon 64 gets set for the US

*The Dragon 64 is due in the US this month – **Craig Hanna,** vice president of the Los Angeles Colour Computer Users' Group, has the details.*

THE RELEASE OF the Dragon 64 in the United States has been in the planning for quite some time, as I learned in a lengthy interview with the director of sales at Tano in New Orleans, Louisiana. George Merchant was more than willing to share information on Tano and the Dragon 64.

Tano is the American corporation responsible for the overall manufacture and distribution of the Dragon 64 in the US. It has been around for 20 years, and has divisions in oil and gasoline, and in maritime as well. Its oil division designs systems to measure flow on oil lines, like the Alaskan pipeline.

Its maritime ventures deal with system monitors for large ocean vessels. Tano knows what precise equipment is required in these devices, and uses that technology in its computer manufacturing as well. "We go through some very exact quality control standards," George says of Tano's production facilities. Dragon/Tano is the joint-venture company involved in the dealings between Tano and Dragon Data in the UK. The Dragon will appear in the US, Canada and Central and South America thanks to Dragon/Tano.

Directors

The directors of the new company are Tony Clarke, Dragon Data's managing director, along with the Welsh firm's marketing director Richard Wadman, Tano's president James Reiss Jr, and Walter Berger Jr, vice president of business operations at Tano.

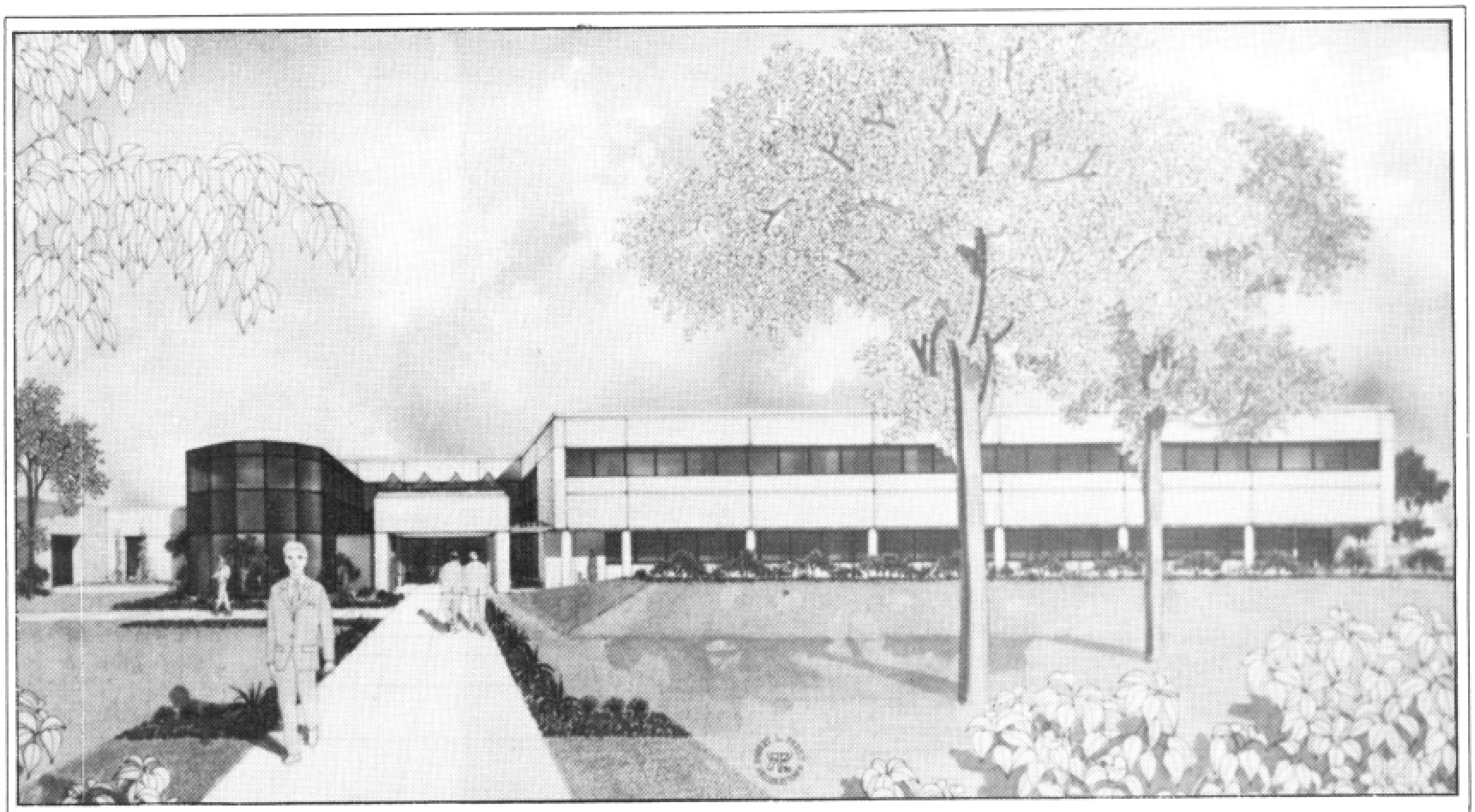
The Dragon 64 is exactly the same as the UK's version, with the exception of the power supply and the video output (due to the different specifications in televisions and monitors between the US and the UK). When you open the box to the Dragon 64 you get the computer, a 160 page manual (with highly detailed memory maps), and software — including an electronic spreadsheet, a mail-merge program, and a word processing package (Telewriter 64) for a retail price of $399.

Software for the Dragon 32 will be available and completely compatible with the 64. Tano will be marketing many of the software packages directly through the dealerships. It is currently looking at approximately 150 different packages for marketing. Tano is licensing software from Dragon Data, while at the same time contacting authors of a number of Colour Computer programs to see about licensing their products as well.

Software

With the number of companies offering software for the Colour Computer in the US, there will definitely be outside support for software, in addition to what Tano will be offering. The adaptability of machine-language software between the Dragon 64 and the Colour Computer will mean quite a number of programs for immediate use on the Dragon. For business-minded users, the aim is to have an 80 column expansion ready by the end of September at the latest. How does Dynacalc sound? Dragon 64's got it.

With the standard 90 day warranty and trained dealers ready to handle most Dragon repair problems, it seems ▶

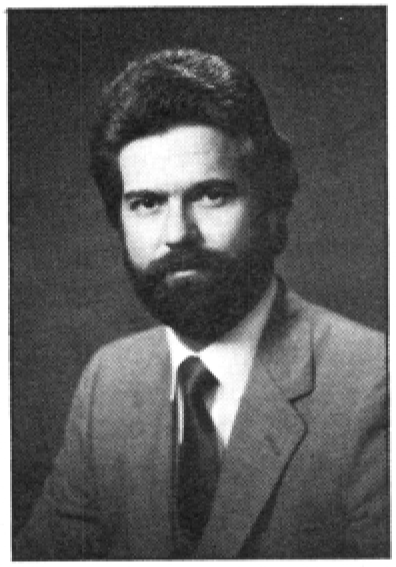


Proposed expansion at Tano – two-storey administration and training centre due to be occupied by the end of this year

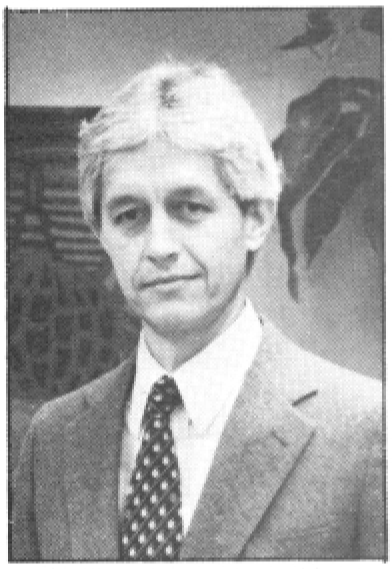
◀ some of the most important backing for a computer is being taken care of. So often, a new computer on the market will have no one to repair it once it is broken, aside from sending it to the company to be fixed. Tano is finishing a contract with Western Union which has 500 repair centres across the country. A Dragon owner can get his computer repaired at any of these places.

The Dragon 64 will sport a cassette player, a disk drive (single and dual), printers (daisywheel and dot-matrix), modems, joysticks, and other peripherals that will be co-ordinated with the look of the Dragon. These features are also expected to be announced towards the end of September. OS9 and Flex will also be available shortly to run on the system. A speech synthesiser will also be ready at the time the Dragon 64 is released. The 64 will also support the same robot arms as are available for the 32.

George describes the Dragon as "the serious, affordable home computer". Tano wants everyone to know that the Dragon 64 is a "nice" machine that is well made. Marketing will be aimed at the family interested in financing, budgeting, and education. Television and newspaper/magazine advertising will be ready soon, and George Merchant says Tano will be advertising first in the Phoenix, Arizona area where the Broadway department store chain will be the dealer for the computer.



US chiefs – Walter Berger Jr . . .



and James Reiss Jr, president

With the "shaking out" of the computer industry in the US and the loss of millions of dollars by companies such as Texas Instruments and Atari, George feels that Tano will be able to compete in the huge market, making the Dragon a serious family machine, not just a video games player.

Sales

Tano estimates that 250,000 machines will sell in the first year of the Dragon 64's release. Sales of the Dragon will be strictly walk-in. Aimed at department and retail stores in large metropolitan shopping centres, the Dragon will not be sold via mail order. The computer will never appear in "lower-end" department store chains, says George.

Tano wants the Dragon to have a good image, and not appear on toy store shelves. It will train all sales people with classes and video to be knowledgeable about the Dragon. Dragon will be selling its computer alone on the shelves, having worked a deal so that the Ataris and Commodores will be on the toy shelves, and the Dragon will be in the electronics department where a more serious computer purchase can be made.

Retail shops other than the larger department stores will be selling the Dragon 64 next to other systems. Initially, there will be 17 dealers for the Dragon. Another 100 or so will have an evaluation unit to decide if they will sell the Dragon. Businesses interested in becoming dealers need to fill out an application and provide credit references, as well as tell a bit about their company.

Dragon design will be handled at both Tano in New Orleans and Dragon in Wales. A new 48,000 square foot building houses the Dragon 64 production lines. Full production on the 64 will begin sometime in October.

And a 128

Tano and Dragon are working very closely together on the design of many new things to come. The Dragon 128 will be announced in November in the US and will feature a dual processing 6809E microprocessor, a 10 key numeric keypad, with the possibility of OS9 bootable upon power-on, and 128K. Tano will be marketing all the new Dragon systems to be coming out of Dragon Data as well.

Tano will give the purchaser of the Dragon a subscription to a newsletter, with tips, new product announcements, club information, and a questions and answers section. This is similar to the newsletter currently available to owners from Dragon Data in the UK.

With a release date of August 26, the Dragon 64 will be ready for sale about September 1. It looks as though Tano is ready for the American market, providing a good machine with readily accessible peripherals, software, and service at a competitive price. ■

Blast aliens with Warp

*Shoot down the aliens to win a medal by playing **Simon Wood's** Warp – a hi-res space game*

ALTHOUGH WRITTEN FOR the 16K Tandy Colour Computer, Warp is perfectly compatible with the Dragon 32. There are no PEEKs to the keyboard (an area in which the two machines differ). The USR routine at memory location 16000 can be relocated at, say, 32000 by Dragon owners. If this is done, then the addresses of the POKEs in line 590 should be changed to 32007 and 32008 respectively.

Warp is a hi-res space game. The idea is to shoot down 10 aliens against whom there is no defence. They never miss. If you're successful you will be presented with a medal. If you run out of fuel you will be returned to base.

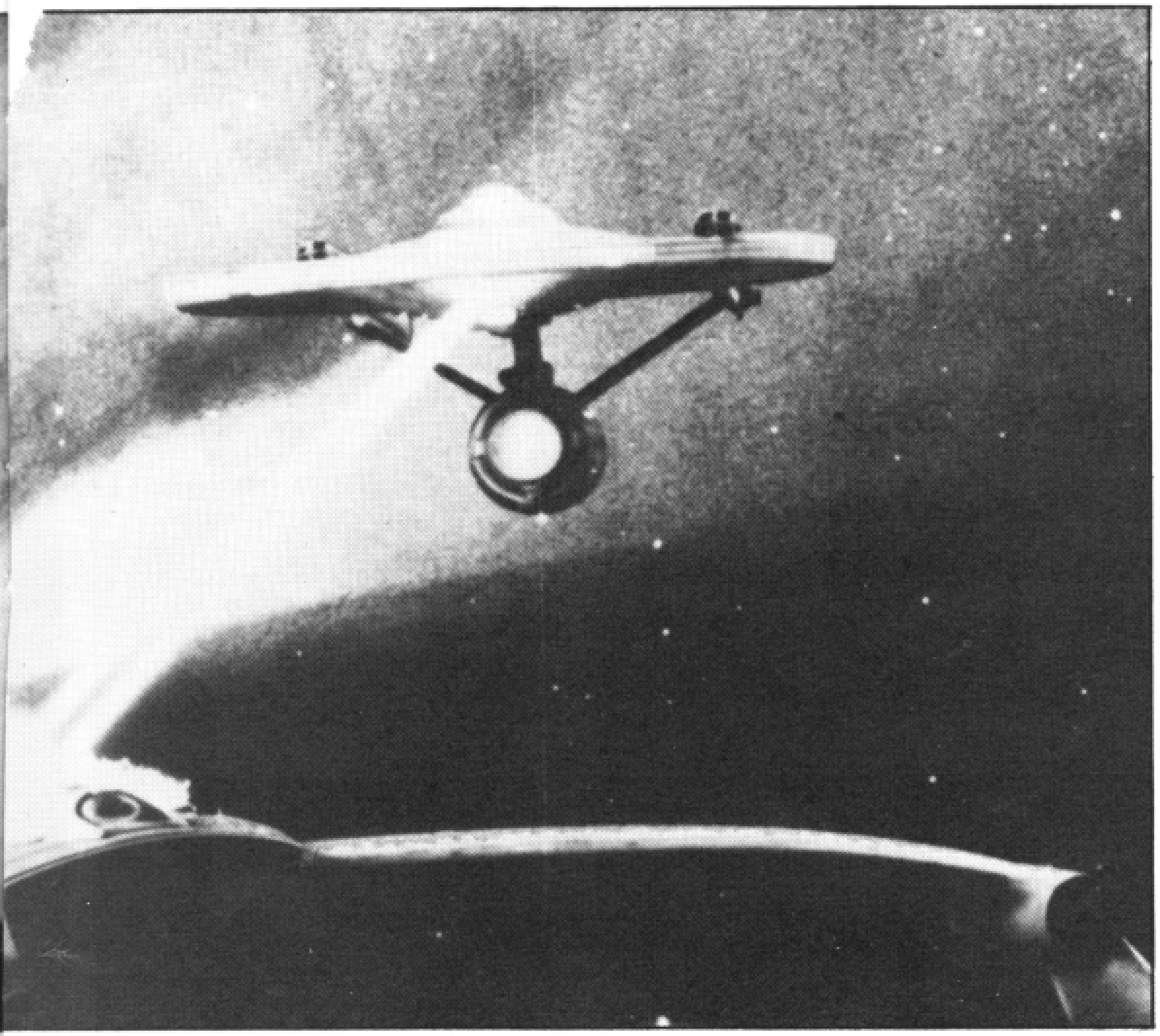


Speed is the essence of this game. If the alien appears in your target area steer it towards the centre of the cross-hairs and try to zap it. If it appears nearer the edge of the screen steer it away from the centre and try to warp it into the target area. Remember: time is fuel. Full instructions are displayed.

Program notes

Lines	
10-80	Delete
120-150	Load machine code
240-300	Sample joysticks (lines 290-300 add random movement to alien)

```
10 '        ***********************
20 '        *        WARP         *
30 '        *         BY          *
40 '        *    SIMON D. WOOD    *
50 '        *    -------------    *
60 '        * TRS-80C/ DRAGON-32  *
70 '        *     COMPATIBLE      *
80 '        ***********************
90 REM*M/CODE DATA FOR*
100 REM*INVERSE SCREEN & ALIEN*
110 REM*EXPLOSION*
120 CLEAR 30,15999
130 DEF USR0=16000
140 DATA 142,0,0,166,137,4,0,132,191,167
,137,4,0,48,1,140,2,0,37,239,57
150 FORI=0TO20:READA:POKE16000+I,A:NEXTI
160 REM*DIMENSION GET/PUT ARRAYS*
170 DIM A(0,14),B(0,6),C(0,14),E(0,18),Q
$(15),K(65)
180 FORI=1TO15:READQ$(I):NEXT
190 PMODE4,1:Q=0:PCLS
200 GOSUB790
210 GOSUB1320
220 REM*MAIN ACTION LOOP*
230 SCREEN1,1:POKE65495,0
240 A=JOYSTK(0):B=JOYSTK(1)
250 F=0:FF=0
260 IF A<32 THEN F=-2 ELSE F=2
270 IF B<32 THEN FF=-2 ELSE FF=2
280 XX=XX-F:YY=YY+FF
290 X=RND(8)-4:Y=RND(8)-4
300 XX=XX+X:YY=YY+Y
310 LINE(225,10)-(245,30),PSET,B
320 DRAW SB$(S/10)
330 LINE(128,50)-(128,86),PSET:LINE(125,
50)-(131,50),PSET
340 LINE(128,106)-(128,142),PSET:LINE(12
5,142)-(131,142),PSET
350 LINE(80,96)-(118,96),PSET:LINE(80,93
)-(80,99),PSET
360 LINE(138,96)-(173,96),PSET:LINE(173,
93)-(173,99),PSET
370 PUT(0,179)-(28,187),B,PSET
380 LINE(35,185)-(FU+25,185),PSET
390 LINE(255,185)-(FU+25,185),PRESET
400 IF XX<=4 THEN LINE(4,YY)-(4,YY+22),P
SET:PLAYW$:LINE(4,YY)-(4,YY+22),PRESET:P
UT (XX,YY)-(XX+22,YY+22),C,PSET:XX=RND(2
25)+5:YY=RND(155)+5
410 IF XX>=232 THEN LINE(251,YY)-(251,YY
+22),PSET:PLAY W$:LINE(251,YY)-(251,YY+2
2),PRESET:PUT(XX,YY)-(XX+22,YY+22),C,PSE
T:XX=RND(225)+5:YY=RND(155)+5
420 IF YY<=4 THEN LINE(XX,4)-(XX+22,4),P
SET:PLAY W$:LINE(XX,4)-(XX+22,4),PRESET:
PUT(XX,YY)-(XX+22,YY+22),C,PSET:XX=RND(2
25)+5:YY=RND(155)+5
430 IF YY>=162 THEN LINE(XX,189)-(XX+22,
189),PSET:PLAY W$:LINE(XX,189)-(XX+22,18
9),PRESET:PUT(XX,YY)-(XX+22,YY+22),C,PSE
T:XX=RND(225)+5:YY=RND(155)+5
440 PUT(XX,YY)-(XX+22,YY+22),A,PSET
450 P=PEEK(65280)
460 IF P=126 OR P=254 OR P=125 OR P=253
THEN GOSUB 520
470 IF RND(40)=5 THEN FOR X=10 TO 50 STE
P 10:CIRCLE(XX+11,YY+11),X,,.5:NEXT X:GO
SUB 680
480 IF FU<=50 THEN PUT(0,179)-(28,187),B
,PRESET:SOUND 50,1
490 IF FU<0 THEN 1220
500 IF INT(TIMER/1000)=TIMER/1000 THEN F
U=FU-10
510 GOTO 220
520 REM**FIRE-BUTTON PRESSED**
530 FORX=38TO18STEP-10
540 CIRCLE(127,96),X
550 CIRCLE(127,96),X,0
560 NEXT X
570 FU=FU-5
580 PLAY"V31;T100;O2;A;B;C;D;O3;A;B;C;D;
O2;A;B;C;D;O1;A;B;C;D"
590 IF PPOINT(128,96)<>0 THEN PUT(77,4)-
(176,10),E,PSET:FOR T=1 TO 250:NEXT T: S
CREEN 0,0:POKE 16007,134:POKE 16008,198:
A=USR(0):POKE 16007,132:POKE 16008,191:F
OR T=1 TO 90:NEXT T:CLS:PCLS:SCREEN 1,1:
PUT(XX,YY)-(XX+20,YY+20),A,PSET:GOSUB 61
0
600 RETURN
610 REM*SCORE A HIT*
620 PCLS
630 PLAY"L255T255O1V31;7;3;3;5;1;2;7;5;5
;4;5;7;V25;5;5;7;3;7;4;5;2;V20;3;5;7;7;1
;1;2;7;4;V15;3;5;3;2;1;2;2;5;5;V10;1;7;4
;2;5;8;1;3;5;7;3;5;3;V5;4;6;7;2;7;3;7;2;
8"
640 XX=RND(225)+5:YY=RND(155)+5
650 S=S+10
660 IF S=100 THEN 1950
670 RETURN
680 REM**ALIEN STRIKE**
690 Q=Q+1
700 IF Q=12 THEN IF FU>50 THEN FU=50
710 PRINT@133,"*DAMAGE STATUS [";Q;"]*"
720 L=LEN(Q$(Q))
730 PRINT@256+INT((32-L)/2),Q$(Q)
740 SCREEN 0,1:FOR W=1 TO 20:PLAY"V31;T2
55;O1":PLAY STR$(RND(12)):NEXT W:CLS
750 IF Q=15 THEN 1790
760 PCLS:FU=FU-10
770 SCREEN 1,1
780 RETURN
790 REM*SET UP HI-RES SCREEN*
800 LINE(7,7)-(7,15),PSET:PSET(6,7):PSET
(6,15)
810 LINE(15,7)-(15,15),PSET:PSET(16,7):P
SET(16,15)
820 FOR R=1 TO 4
830 CIRCLE(11,11),R,,.75
840 NEXT R
850 PRESET(9,11):PRESET(13,11)
860 GET(0,0)-(22,22),A,G
870 GET(150,0)-(172,22),C,G
880 SB$(0)="BM235,17;L1;G1;D4;F1;R2;E1;U
4;H1"
890 SB$(1)="BM235,17;D6"
900 SB$(2)="BM235,17;L1;G1;BD3;D2;R4;BU5
;NG4;H1"
910 SB$(3)="BM235,17;L1;G1;BD3;D1;F1;R2;
E1;U1;H1;NR1;E1;U1;H1"
920 SB$(4)="BM235,17;R1;D3;NR1;ND3;L4;E3
"
930 SB$(5)="BM235,17;NR2;L3;D3;R4;F1;D1;
G1;L4"
940 SB$(6)="BM235,17;NR2;L1;G1;D2;R3;F1;
D1;G1;L2;H1;U1"
950 SB$(7)="BM235,17;NL2;R2;D1;G4;D1"
960 SB$(8)="BM235,17;L1;G1;D1;F1;G1;D1;F
1;R2;E1;U1;H1;NL2;E1;U1;H1;L1"
970 SB$(9)="BM235,17;L1;G1;D1;F1;R3;U2;N
H1;D4;G1;L3"
980 PCLS
990 XX=RND(215)+10:YY=RND(145)+10
1000 FU=235:S=0
1010 DRAW"BM1,180;D6;U3;NR3;U3;R4;"
1020 DRAW"BM8,180;D5;F1;R2;E1;U5;"
1030 DRAW"BM15,180;D6;NR4;U3;NR3;U3;R4;"
1040 DRAW"BM22,180;D6;R4;"
1050 GET(0,179)-(28,187),B,G
1060 DRAW"BM78,5;R4;L2;D5;"
1070 DRAW"BM85,5;BD1;D4;U2;R4;ND2;U2;H1;
L2;G1;"
1080 DRAW"BM92,5;D5;U2;R3;NF2;R1;E1;U1;H
1;L3;"
```



310-390	Draw screen
400-430	Test for warp
590	Tests if alien hit. If yes, POKEs to machine-code routine to change its function (explosion), displays destroyed alien (alien squeezed into under-sized array)
730	Centres messages on the text screen
1770-1780	Damage status messages. Only the twelfth message, "Port fuel tank holed", should be left intact — when it is encountered your ship's reactions slow down. The others can be tailored to suit your particular sense of humour
2030-2070	Draw your medal

Arrays and variables

Array A: Alien
Array B: 'Fuel'
Array C: Blank
Array E: 'Target locked'
Q$: Damage messages
K: Screen positions for titles
SB$: Score numerals
S: Score
FU: Fuel
W$: Warp sound
XX,YY: Alien array co-ordinates

```
1090 DRAW"BM100,5;BR1;NR3;G1;D3;F1;R3;E1
;U1;L2;"
1100 DRAW"BM108,5;NR4;D5;NR4;U2;R3;"
1110 DRAW"BM115,5;R4;L2;D5;"
1120 DRAW"BM137,5;D5;R4;"
1130 DRAW"BM144,5;BR1;R2;F1;D3;G1;L2;H1;
U3;E1;"
1140 DRAW"BM151,5;BR1;R2;F1;H1;L2;G1;D3;
F1;R2;E1;"
1150 DRAW"BM158,5;D5;U2;E3;G2;F3;"
1160 DRAW"BM165,5;D5;NR4;U2;NR3;U3;R4;"
1170 DRAW"BM172,5;D5;R3;E1;U3;H1;L3;"
1180 GET(77,4)-(176,10),E,G
1190 W$="V31T25501F02D03B04G05E"
1200 PCLS
1210 RETURN
1220 REM*OUT OF FUEL*
1230 CLS(6):SCREEN 0,1
1240 PRINT@11,"out"CHR$(223)"of"CHR$(223
)"fuel";
1250 PRINT@40,"RETURNED TO BASE";
1260 PRINT@101,"YOU ZAPPED "S/10" ALIENS
";
1270 PRINT@165,"ANOTHER MISSION (Y/N)?";
1280 A$=INKEY$:IF A$="" THEN 1280
1290 IF A$="Y" THEN RUN
1300 IF A$<>"N" THEN 1280
1310 END
1320 REM*INSTRUCTIONS*
1330 POKE 65495,0
1340 CLS(6)
```

```
1350 FORU=1TO63:READK:PRINT@K,CHR$(207);
:NEXTU
1360 PRINT@480,"  TRS-80C/DRAGON-32 COMP
ATIBLE ";:POKE1535,143
1370 FOR T=1 TO 1000:NEXT T:POKE1535,128
1380 A=USR(0)
1390 FOR T=1 TO 1500:NEXT T
1400 CLS
1410 PRINT:PRINT
1420 PRINT"YOU ARE THE COMMANDER OF A"
1430 PRINT"TRS-80 SPACE INTERCEPTOR"
1440 PRINT"ON AN INTERSTELLAR MISSION,"
1450 PRINT"WHICH IS TO SHOOT DOWN AS MAN
Y"
1460 PRINT"ALIEN SPACECRAFT AS POSSIBLE"
1470 PRINT"BEFORE YOUR FUEL RUNS OUT."
1480 PRINT"TO RETURN HOME A HERO"
1490 PRINT"YOU MUST SHOOT DOWN 10 ALIENS
."
1500 PRINT"YOUR SHIP CAN SUSTAIN A MAXIM
UM"
1510 PRINT"OF 15 ALIEN STRIKES."
1520 PRINT"DAMAGE STATUS WILL BE GIVEN"
1530 PRINT"DURING YOUR MISSION."
1540 PRINT:PRINT"PRESS <ENTER> TO CONTIN
UE"
1550 A=USR(0)
1560 A$=INKEY$:IF A$<> CHR$(13) THEN 156
0
1570 A=USR(0)
1580 CLS:PRINT
```

```
1590 PRINT"YOU CONTROL YOUR INTERCEPTOR"
1600 PRINT"USING THE  RIGHT JOYSTICK AND
"
1610 PRINT"FIRE YOUR LASERS BY PRESSING"
1620 PRINT"THE RED BUTTON."
1630 PRINT"YOU CAN ALSO USE YOUR SHIP'S"
1640 PRINT"WARP BEAM TO NUDGE ALIEN CRAF
T"
1650 PRINT"INTO YOUR TARGET AREA."
1660 PRINT"THE WARP AREA IS THE BORDER"
1670 PRINT"OF YOUR SCREEN."
1680 PRINT"THIS MANOUVER CAN SAVE YOU"
1690 PRINT"TIME AND FUEL, BUT DOES"
1700 PRINT"NOT ALWAYS WORK. GOOD LUCK!"
1710 PRINT
1720 PRINT"PRESS ANY KEY TO LAUNCH"
1730 PRINT@472,CHR$(143+16*RND(7));:A$=I
NKEY$:A=USR(0):FOR T=1 TO  15:NEXT T:IF
A$="" THEN 1730
1740 CLS
1750 RETURN
1760 REM*DAMAGE STATUS DATA*
1770 DATA SHIELDS HOLDING,REACTOR INTACT
,PAINT SCORCHED,WING PLATES BUCKLED,SHIP
'S CAT SICK,INERTIA GUIDANCE STABLE,WARP
-DRIVE WARPED,DEFLECTOR SHIELDS WEAKENIN
G,ION-DRIVE AT 70%,RADIATION HAZARD,SCOT
TY HAS BEAMED DOWN,PORT FUEL TANK HOLED
1780 DATA PANIC STATIONS,YOU HAVEN'T MUC
H TIME LEFT,GOODBYE WORLD!
1790 REM*ALIENS KILL YOU*
1800 CLS(6)
1810 PRINT@73,"YOU ARE DEAD!";
1820 FOR T=1 TO 500:NEXT T
1830 PLAY"V15;T2;O1;L4;3;P16;3;P64;L9;3;
L5;3;P8;L5;6;L8;5;P65;5;P32;L8;3;P64;3;P
16;2;P64;3"
1840 FOR T=1 TO 500:NEXT T
1850 PRINT@100,"YOUR SPACESHIP HAS BEEN"
;
1860 PRINT@138,"MELTED DOWN";
1870 PRINT@168,"AND TURNED INTO";
1880 PRINT@197,"NON-STICK FRYING PANS";
1890 PRINT@259,"BUT WE HAVE THE TECHNOLO
GY";
1900 PRINT@297,"TO REBUILD YOU";
1910 PRINT@358,"ANOTHER CHANCE (Y/N)?";
1920 A$=INKEY$:IF A$="" THEN 1920
1930 IF A$="Y" THEN RUN
1940 IF A$="N" THEN END ELSE 1920
1950 REM*ALL ALIENS KILLED*
1960 CLS(6)
1970 PRINT@72,"WELL DONE, HERO!";
1980 FOR T=1 TO 500:NEXT T
1990 PRINT@133,"YOU ZAPPED "S/10" ALIENS
!";
2000 FOR T=1 TO 500:NEXT T
2010 PRINT@195,"THE FEDERATION HONOURS Y
OU";
2020 FOR T=1 TO 500:NEXT T
2030 PRINT@291,CHR$(219);:PRINT@297,CHR$
(215);
2040 PRINT@292,CHR$(179);:PRINT@293,CHR$
(195);:PRINT@294,CHR$(163);:PRINT@295,CH
R$(195);:PRINT@296,CHR$(179);
2050 PRINT@324,CHR$(191);:PRINT@325,CHR$
(207);:PRINT@326,CHR$(175);:PRINT@327,CH
R$(207);:PRINT@328,CHR$(191);
2060 PRINT@356,CHR$(191);:PRINT@357,CHR$
(207);:PRINT@358,CHR$(175);:PRINT@359,CH
R$(207);:PRINT@360,CHR$(191);
2070 PRINT@389,CHR$(214);:PRINT@391,CHR$
(217);:PRINT@422,CHR$(72);
2080 FOR T=1 TO 300:NEXT T
2090 PLAY"V15;T3;O2;L7;5;3;L4;1;5;8;O3;L
2;1;L7;5;3;L4;1;O2;5;7;L3;8"
2100 FOR T=1 TO 1000:NEXT T
2110 PRINT@457,"ANOTHER MISSION (Y/N)?";
2120 A$=INKEY$:IF A$= "" THEN 2120
2130 IF A$="Y" THEN RUN
2140 IF A$="N" THEN END ELSE 2120
2150 REM*WARP LOGO DATA*
2160 DATA 164,168,170,171,172,173,174,17
6,177,178,179,180,182,183,184,185,186
2170 DATA 196,200,202,206,208,212,214,21
8
2180 DATA 228,230,232,234,235,236,237,23
8,240,241,242,243,244,246,247,248,249,25
0
2190 DATA 260,261,262,263,264,266,270,27
2,275,278
2200 DATA 307,339,340,341,342,343,344,34
5,346,347,348
```

Wake up your Dragon — using animation

Keith and *Steven Brain introduce animation and just fail to win the Olympics in this extract from their latest book, "Advanced sound and graphics".*

THE NEXT STEP on from simply moving things around the screen is to animate a design — that is move parts of it to give the impression that it is "alive". This article looks at a SET point approach to producing the effect of a figure running. First we designed two alternative figures, the first showing a stationary figure facing forwards, and the second a running figure facing to the right.

The co-ordinates are in DATA statements and READ into arrays, but there are really two alternative sets of co-ordinates. The first 35 points (in line 5020) make up one figure (stationary), and points 36 to 59 (in line 5030) the other (running). Only two arrays need be used as we can take any points from an array at any time and do not have to start from the beginning of the DATA each time. Subroutines to SET each figure are in lines 1000 and 2000.

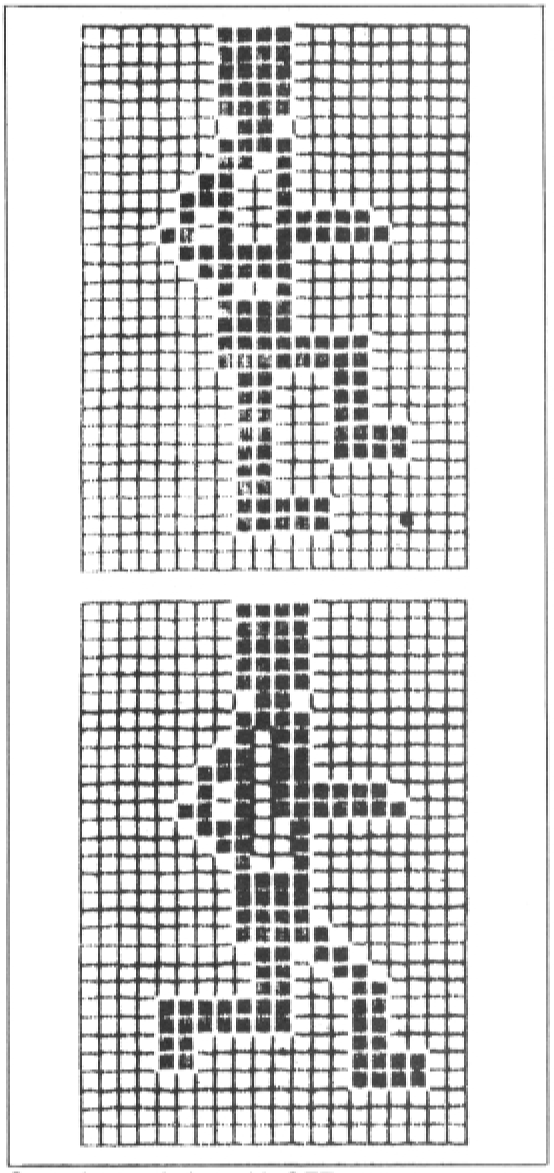
If you trace the order of the DATA points and then watch this program in operation you will see that the simple animation effect is achieved because the leg points are SET relatively slowly and in a particular sequence so that one leg appears before the other. There is no point in converting these SET points to the equivalent CHR$ as the increase in speed would mask the effect of movement here.

The sequence of operation is as follows. The title is printed and if no key is pressed then the first figure is displayed by the subroutine at 1000. If a key is pressed the program drops through to 120 which updates the screen offset (X0), clears the old picture, goes to the subroutine to SET the second figure (2000), clears to screen again, and reprints the title (see listing 1).

An alternative to CLS0 is to use a single 192 character string (BL$) to erase only the top of the screen (PRINT positions 0 to 191):

```
  40 BL$ = STRING$(192,128)
 120 X0 = X0 + 1:PRINT @0,BL$;:
     GOSUB
2000 :PRINT @0,BL$;: GOTO 110
```

The runner described above appeared to move because of the slowness of SET and RESET and it is also possible to use the techniques described for these with PSET and PRESET in hi-res. However, you can produce much smoother animation in hi-res if you use GET and PUT, although of course you still need to make the pictures to GET and PUT first. Two "frames" for the movement of a sprinter can be formed by PSETting the co-ordinates given in the DATA statements, as shown in listing 2.



Smoother sprinting with GET and PUT

Once the two frames have been PSET (a very slow job, but at least it only has to be done once!) you can GET them into arrays F1 and F2, and PCLS away the figures you just PSET ready for the animated sequence:

```
 70 DIM F1(50): DIM F2(50)
120 GET(5,0) – (30,27),F1,G
130 GET(55,0) – (80,27),F2,G
140 PCLS
```

The simplest sequence is to PSET each array in turn so that the figure runs on the spot half way down the left-hand side of the screen:

```
180 PUT(X,100) – (X + 25,127),F1,
    PSET
200 PUT(X,100) – (X + 25,127),F2,
    PSET
230 GOTO 180
```

If you now arrange to increment X in a FOR. . .NEXT loop he runs across the screen from left to right. Notice that each frame is shown at each X step before X is updated:

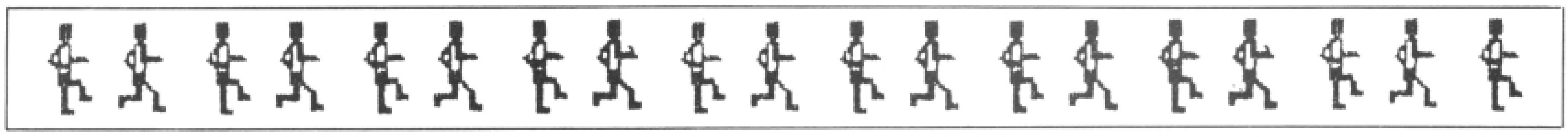
```
160 FOR X = 1 TO 230 STEP 5
220 NEXT X
230 GOTO 140
```

He moves very smoothly and quite rapidly across the screen, but what happens if there is a visible background behind him? Add in some horizontal lines to give a test background and RUN again.

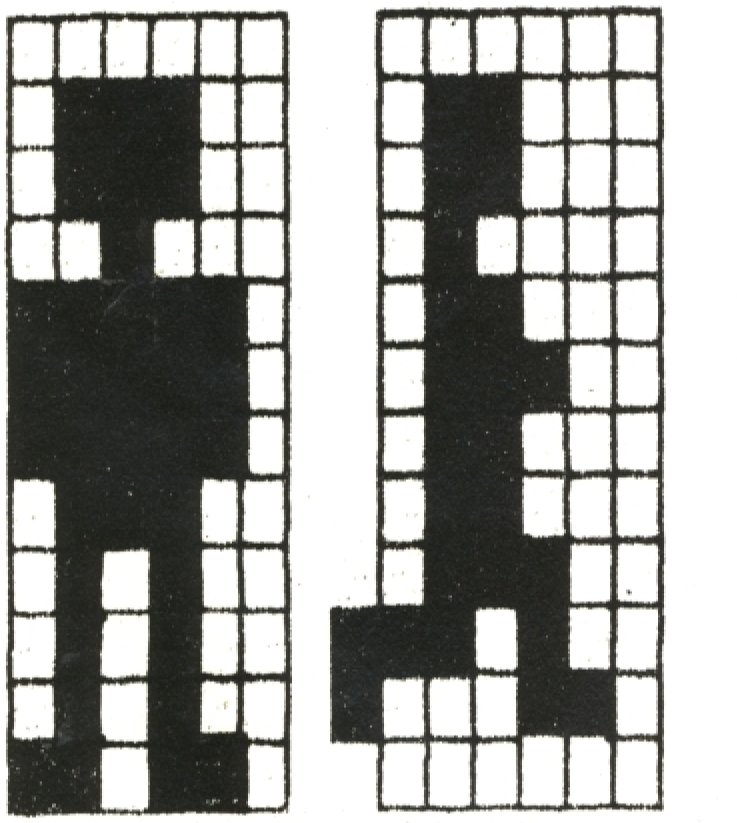
```
150 FOR LI = 1 TO 30 STEP 5:
    LINE(0,LI) – (255,LI),PSET: NEXT LI
```

However, the lines vanish as the man runs over them, which is not much use in a real program.

We could GET the background just before we PUT the figure and then PUT the background back when it moved on. We only GET the background once for both frames as it is the original background we need to PUT back. If we just recreate the background with PSET then the ►



```
10 GOSUB 5000
20 CLS0
30 XO=2:YO=0:C=2
100 PRINT @256,"RUNNER"
110 IF PEEK(337)=255 THEN GOSUB
1000:GOTO 110
120 XO=XO+1:CLS0:GOSUB 2000:CLS0
:GOTO 100
1000 FOR N=1 TO 35:SET(X(N)+XO,Y
(N)+YO,C):NEXT N:RETURN
2000 FOR N=36 TO 59:SET(X(N)+X0,
Y(N)+YO,C):NEXT N:SOUND1,1:RETUR
N
5000 DIM X(59),Y(59)
5010 FOR N=1 TO 59:READ X(N),Y(N
):NEXT N:RETURN
5020 DATA 1,1,2,1,3,1,1,2,2,2,3,
2,2,3,0,4,1,4,2,4,3,4,4,4,0,5,1,
5 2,5,3,5,4,5,0,6,1,6,2,6,3,6,4,
6,1,7,2,7,3,7,1,8,3,8,1,9,3,9,1,
10,3,10,0,11,1,11,3,11,4,11
5030 DATA 1,1,1,2,2,1,2,2,1,3,1,
4,1,5,1,6,1,7,2,4,2,5,2,6,2,7,3,
5,1,8,2,8,3,8,3,9,3,10,4,10,1,9,
0,9,-1,9,-1,10
```



Listing 1 – stationary and running figure

```
10 DATA 4,0,5,0,6,0,7,0,4,1,5,1,
6,1,7,1,4,2,5,2,6,2,7,2,4,3,5,3,
6,3,7,3,4,4,5,4,6,4,7,4,5,5,6,5,
4,6,5,6,6,6,7,6,4,7,5,7,7,7,3,8,
4,8,7,8,2,9,3,9,4,9,7,9,2,10,4,1
0,7,10,8,10,9,10,10,10,11,10,1,1
1,2,11,4,11,7,11,8,11,9,11,10,11
,11,11,12,11,2,12,3,12
20 DATA 4,12,5,12,6,12,7,12,3,13
,4,13,5,13,6,13,7,13,4,14,7,14,4
,15,5,15,6,15,7,15,4,16,5,16,6,1
6,7,16,4,17,5,17,6,17,7,17,8,17,
9,17,10,17,4,18,5,18,6,18,7,18,8
,18,9,18,10,18,5,19,6,19,10,19,1
1,19,5,20,6,20,10,20,11,20,5,21,
6,21,10,21,11,21,5,22,6,2
30 DATA 10,22,11,22,12,22,13,22,
5,23,6,23,10,23,11,23,12,23,13,2
3,5,24,6,24,5,25,6,25,5,26,6,26,
7,26,8,26,5,27,6,27,7,27,8,27
40 DATA 55,0,56,0,57,0,58,0,55,1
,56,1,57,1,58,1,55,2,56,2,57,2,5
8,2,55,3,56,3,57,3,58,3,55,4,56,
4,57,4,58,4,56,5,57,5,55,6,56,6,
57,6,58,6,55,7,57,7,58,7,54,8,55
,8,57,8,58,8,53,9,54,9,55,9,57,9
,58,9,53,10,55,10,57,10,58,10,59
,10,60,10,61,10,62,10
50 DATA 52,11,53,11,55,11,57,11,
58,11,59,11,60,11,61,11,62,11,63
,11,53,12,54,12,55,12,58,12,54,1
3,55,13,58,13,55,14,58,14,55,15,
56,15,57,15,58,15,55,16,56,16,57
,16,58,16,55,17,56,17,57,17,58,1
7,55,18,56,18,57,18,58,18,59,18,
56,19,57,19,59,19,60,19
60 DATA 56,20,57,20,60,20,61,20,
56,21,57,21,61,21,62,21,51,22,52
,22,53,22,54,22,55,22,56,22,57,2
2,61,22,62,22,51,23,52,23,53,23,
54,23,55,23,56,23,57,23,61,23,62
,23,51,24,52,24,61,24,62,24,51,2
5,52,25,61,25,62,25,63,25,64,25,
61,26,62,26,63,26,64,26
80 PMODE 4,1:SCREEN1,0:PCLS
90 FOR N=1 TO 249
100 READ X,Y:PSET(X+10,Y)
110 NEXT N
```

Listing 2 – smoother animation for sprinting

◀ lines reappear, but with flashing and whilst each frame of the figure is shown part of the lines are erased:

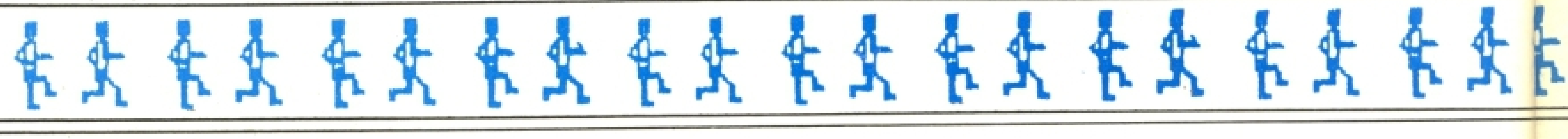
```
70 DIM F1(20): DIM F2(20): DIM BG(20)
170 GET(X,0) – (X + 25,27),BG,G
210 PUT(X,0) – (X + 25,27),BG,PSET
```

To get a smoother replacement of the background (fig 157) we need to make things a little more complicated, and apply some logical actions in our PUT commands:

```
180 PUT(X,0) – (X + 25,27),F1,OR
190 PUT(X,0) – (X + 25,27),BG,AND
200 PUT(X,0) – (X + 25,27),F2,OR
210 PUT(X,0) – (X + 25,27),BG,AND
```

First we PUT the first frame (F1) over the background (BG) with OR. This gives background plus frame 1 as all points which are set in either array OR screen are set. Now we PUT back the background (BG) with AND so that only points which are common to both the current screen and the original screen remain set. This produces the original position and we can then PUT the second frame (F2) with OR and then AND this with the background (BG) as for frame 1. Notice that it is essential to PUT the background back between frames if you are to avoid problems with the International Athletics Association over three-legged sprinters.

The only real disadvantages of GET and PUT animation are that you cannot change the scale, colour or angle of your design. DRAW will allow you to change these factors, but as it is slower than GET and



PUT it is only useful for some applications, and new designs are best produced on graphics pages which are out of sight and then PCOPYed back to the current screen. As an example we will look at producing an oasis in the desert which gets bigger as you approach it.

First we need to PCLEAR all eight graphics pages and PCLS the first four to yellow (colour 2) to represent the sand:

```
10 PCLEAR 8: PMODE 3,1: SCREEN
   1,0: PCLS2
```

The quickest way to set the top half of the screen to blue for the sky is to change the PMODE to 1 (which only uses two pages) and PCLS to 3. Remember that as there is no SCREEN command you are still looking at PMODE 3. Now we change the PMODE back to 3 and make a painted circle for the sun:

```
20 PMODE 1,1: PCLS 3: PMODE 3,1: CI
   RCLE(230,30),20,2: PAINT(230,30),
   2,2
```

In each picture the oasis is built up on a hidden screen on pages 5 to 8. PCLS 2 in PMODE 3 sets this to yellow and then PCLS 3 in PMODE 1 makes the top half blue:

```
50 PMODE 3,5: PCLS2: PMODE 1,5:
   PCLS3: PMODE 3,5
```

The actual oasis is produced with DRAW and PAINT:

```
40 A$ = "C1LGER2FHLFHGEC4": W$
   = "BM1 28,110C3BM - 6, +
   0FR10EL13BM + 6, + 0": PT$ =
   "C4U5XA$;BM + 4, + 5U4XA$;BM -
   8, + 4U3C1XA$;"
60 DRAW W$: PAINT(128,111),3,3: DR
   AW PT$
```

To see the oasis on the screen we must PCOPY the last three pages of the hidden screen on to the last three pages of the screen on display. As the top page does not change there is no point copying this:

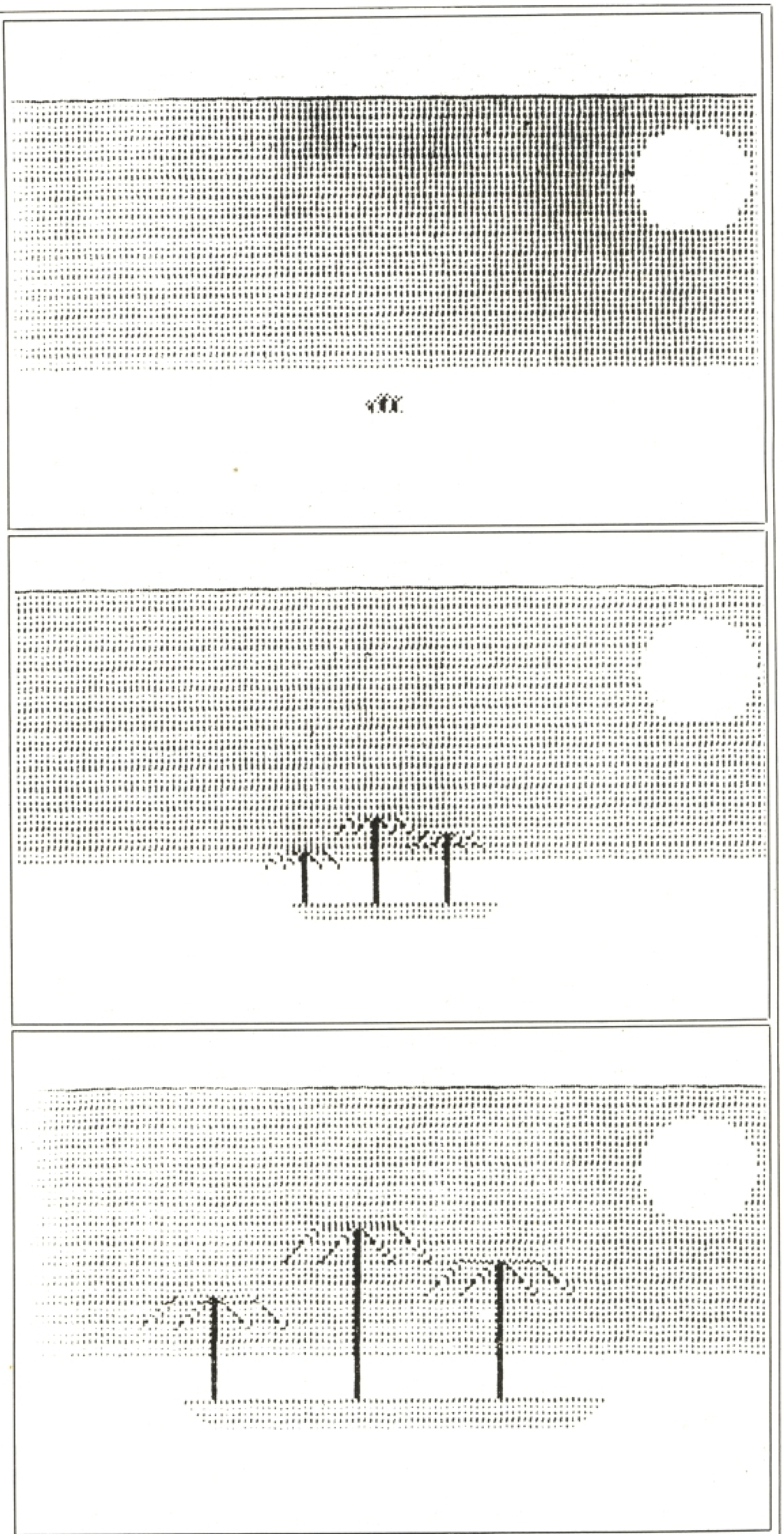
```
70 PCOPY 6 TO 2: PCOPY 7 TO 3:
   PCOPY 8 TO 4
80 SOUND(S * 5),1
90 GOTO 90
```

If you RUN this you will see a minute oasis in the far distance (fig 159), but if you add an incrementing scale factor (S) it will increase rapidly in size:

```
30 FOR S = 4 TO 48 STEP 4: DRAW"S"
   + STR$(S)
90 NEXT S
```

Of course mirages are very common in the desert so you shouldn't be too surprised when your head starts to spin and the oasis vanishes into the distance again:

```
100 FOR A = 0 TO 3: PMODE 3,1:
    PCLS2: PMODE 1,5: PCLS3:
    PMODE 3,5: DRAW "A" + STR$(A)
    + "S" + STR$ (48 - (16 * A)) + W$
    + PT$
110 PCOPY 6 TO 2: PCOPY 7 TO 3:
    PCOPY 8 TO 4: NEXT A
120 FOR N = 255 TO 1 STEP - 5:
    SOUND N,1: NEXT N
130 RUN ■
```



The oasis in the desert keeps getting bigger as you get nearer

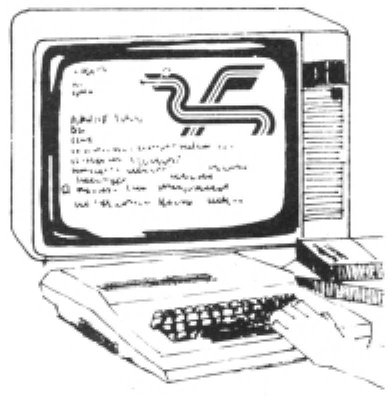
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Don't be afraid of disassembly

***Robin Telkman** offers his assistance if you're struggling with disassembly.*

THIS PROGRAM CONVERTS machine code into an assembler type mnemonic list giving decimal, hex address, machine code and mnemonic. It consists of a FOR-NEXT loop for the memory address, within which it sifts out the opcode and length/format using rather a lot of IF-THEN-ELSE statements. Due to the complexity of 6809 language (the chip on which the Dragon is based) a simple look-up table will not work.

The program asks you for start address, end address, number of data fields and program name. It then immediately lists all the instructions to either the screen or printer depending on whether you entered 0 or 2 initially. If you don't enter zero for the number of data fields it will ask for the start address of each data field. When it comes to these addresses it will then ask which format the data is to be printed in and the length of the data field (see list 1).

List 1: asks which format data is to be printed in and length of data field

```
32984 80D8 FFDD6E8400001981
32992 80E0 8381                                 $8381
32994 80E2 3C0E                                 $3C0E
32996 80E4 821E                                 $821E
32998 80E6 8168                                 $8168
33000 80E8 455854454E444544204 34F4C4F52204241534943203 12E30 E X T E N D E D   C
O L O R   B A S I C   1 . 0
```

Lines 20-80 input the parameters. Line 100 sets up FOR-NEXT loop. Lines 120-160 load MS$ and LS$ with the MSB and LSB of the hex data and convert it to a decimal value (V) on which it goes to 16 subroutines to identify the opcode. If, when it returns, AS$ (assembler $) is null it chops the HD$ (hex data $) to one byte and prints DATA. The opcode length is then added to the index (I) less one before completing the loop.

Line 170 is the print subroutine. Lines 180-200, 210-250, 290-310, 320-360, 380-390, 400-410, 420-430, 440-450, 460-490, 500-510, 520-530, 540-550, 560-580, 590, 600 and 610 are the subroutines for the MSB of the opcode.

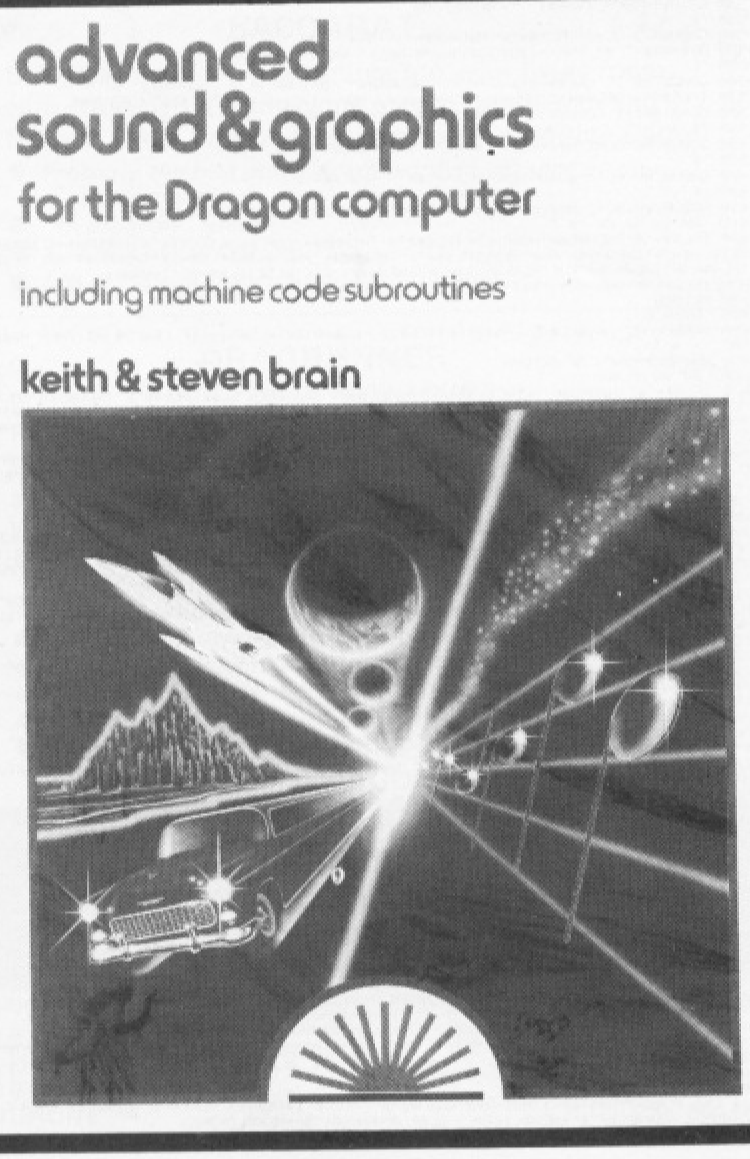
Branch instructions

Lines 260-280 are the subroutine for naming branch instructions. Lines 620-640, 670-690, 700-720, 930-940, 950-960 and 970-980 do the same for other repetitive instructions.

Lines 650-660 read memory into the strings (A is temporary index). Lines ▶

```
5 '6809 DISSASSEMBLER R.J.TELKMAN 1983
20 CLEAR1000:CLS
30 INPUT"SCREEN(0) PRINTER(2)";DN:IF DN=0 OR DN=2 THEN40 ELSE 30
40 INPUT"START ADDRESS";SA
50 INPUT"END ADDRESS";EA
60 INPUT"ANY DATA FIELDS";N
70 IF N>0 THEN DIMT(N):FOR X=1 TO N:PRINT"FIELD START ADDRESS ";X;:INPUTT(X):NEX
TX
80 INPUT"PROGRAM NAME";N$
90 CLS:IF N$<>"" THENPRINT#-DN,N$;CHR$(13);
100 FOR I=SA TO EA
110 FOR X=1 TO N:IF I=T(X) THEN GOSUB 1000:NEXTX ELSE NEXTX
120 HD$="":AS$="":A=I:GOSUB650:V=ASC(MS$):IF V>57 THEN V=V-55 ELSE V=V-48
130 ON V+1 GOSUB 180,210,290,320,380,400,420,440,460,500,520,540,560,590,600,610
140 IFAS$<"  " THEN OL=1:HD$=LEFT$(HD$,2):AS$="DATA: "+HD$+" ":IF D>31 THEN IFD<
128 THENAS$=AS$+CHR$(D) ELSE IF D-128>31 THEN AS$=AS$+CHR$(D-128)
150 GOSUB170:IF OL>1THENI=I+OL-1
160 OL=0:NEXTI:END
170 PRINT#-DN,I;:PRINT#-DN,TAB(6)HEX$(I);:PRINT#-DN,TAB(12)HD$;:PRINT#-DN,TAB(21
+DN*10)AS$;CHR$(13);:RETURN
175 '0
180 GOSUB620:IF AS$<>"" THEN OL=2:AS$=AS$+" $(DP)" ELSE200
190 A=I+1:GOSUB650:AS$=AS$+MS$+LS$
200 RETURN
205 '1
210 OL=1:IFLS$="2"THENAS$="NOP"ELSEIFLS$="3"THENAS$="SYNC"ELSEIFLS$="9"THENAS$="
DAA"ELSEIFLS$="D"THENAS$="SEX"ELSEIFLS$="0"ORLS$="1"THEN730ELSE230
220 RETURN
230 OL=2:IFLS$="C"THENAS$="ANDCC #":GOTO190ELSEIFLS$="A"THENAS$="ORCC #":GOTO190
ELSEIFLS$="E"THENAS$="EXG"ELSEIFLS$="F"THENAS$="TFR"ELSE250
240 A=I+1:GOSUB650:GOSUB1410:AS$=AS$+" "+F$+","+T$:RETURN
250 IFLS$="6"THENOL=3:AS$="LBRA ":GOTO910ELSEIFLS$="7"THENOL=3:AS$="LBSR ":GOTO9
10 ELSE RETURN
255 'BRANCH
260 IFLS$="0"THENAS$="RA"ELSEIFLS$="1"THENAS$="RN"ELSEIFLS$="2"THENAS$="HI"ELSEI
FLS$="3"THENAS$="LS"ELSEIFLS$="4"THENAS$="HS"ELSEIFLS$="5"THENAS$="LO"ELSEIFLS$=
"6"THENAS$="NE"ELSEIFLS$="7"THENAS$="EQ"ELSEIFLS$="8"THENAS$="VC"ELSEIFLS$="9"TH
ENAS$="VS
270 IFLS$="A"THENAS$="PL"ELSEIFLS$="B"THENAS$="MI"ELSEIFLS$="C"THENAS$="GE"ELSEI
FLS$="D"THENAS$="LT"ELSEIFLS$="E"THENAS$="GT"ELSEIFLS$="F"THENAS$="LE"
280 RETURN
285 '2
290 GOSUB260
300 OL=2:AS$="B"+AS$:A=I+1:GOSUB650:IF D>127 THEN D=D-256
310 AS$=AS$+" $"+HEX$(I+2+D):RETURN
315 '3
320 OL=1:IFLS$="9"THENAS$="RTS":RETURNELSEIFLS$="A"THENAS$="ABX":RETURNELSEIFLS$
="B"THENAS$="RTI":RETURNELSEIFLS$="D"THENAS$="MUL":RETURNELSEIFLS$="F"THENAS$="S
WI1":RETURN
330 OL=2:IFLS$="C"THENAS$="CWAI ":A=I+1:GOSUB650:GOTO1230ELSEIFLS$="4"THENAS$="P
SHS"ELSEIFLS$="5"THENAS$="PULS"ELSEIFLS$="6"THENAS$="PSHU"ELSEIFLS$="7"THENAS$="
PULU"ELSE350
340 A=I+1:GOSUB650:GOTO1320
350 IFLS$="0"THENAS$="LEAX"ELSEIFLS$="1"THENAS$="LEAY"ELSEIFLS$="2"THENAS$="LEAS
"ELSEIFLS$="3"THENAS$="LEAU"ELSERETURN
360 GOSUB1050:AS$=AS$+" "+R$:RETURN
365 '4
380 GOSUB620:OL=1:IFAS$<>"" THEN AS$=AS$+"A":IF LS$="E"THEN AS$=""
390 RETURN
395 '5
400 GOSUB620:OL=1:IFAS$<>"" THEN AS$=AS$+"B":IFLS$="E"THENAS$=""
410 RETURN
415 '6
420 GOSUB620:OL=2:IF AS$<>"" THENGOSUB1050:AS$=AS$+" "+R$
430 RETURN
435 '7
440 GOSUB620:IFAS$<>"" THEN OL=3:AS$=AS$+" $":FORX=1TO2:GOSUB990:NEXTX
450 RETURN
455 '8
460 GOSUB670:IF LEFT$(AS$,2)="ST"THENAS$="":RETURNELSE AS$=AS$+" #"
470 IFLS$="3"ORLS$="C"ORLS$="E"THENOL=3:FORX=1TO2:GOSUB990:NEXTX:RETURN
480 IFLS$="D"THENAS$=LEFT$(AS$,2):GOTO300ELSE OL=2:X=1:GOSUB990
490 RETURN
495 '9
500 GOSUB670:OL=2:IFLS$="D"THENAS$="J"+AS$
510 AS$=AS$+" $(DP)":X=1:GOSUB990:RETURN
```

```
515 'A
520 GOSUB670:OL=2:IFLS$="D"THEN AS$="J"+AS$
530 GOSUB1050:AS$=AS$+" "+R$:RETURN
535 'B
540 GOSUB670:OL=3:IFLS$="D"THENAS$="J"+AS$
550 AS$=AS$+" $":FORX=1TO2:GOSUB990:NEXTX:RETURN
555 'C
560 GOSUB700:IF LEFT$(AS$,2)="ST"THENAS$="":RETURN ELSE AS$=AS$+" #"
570 IFLS$="3"ORLS$="C"ORLS$="E"THENOL=3:FORX=1TO2:GOSUB990:NEXTX:RETURN
580 OL=2:A=I+1:GOSUB650:AS$=AS$+MS$+LS$:RETURN
585 'D
590 GOSUB700:OL=2:AS$=AS$+" $(DP)":X=1:GOSUB990:RETURN
595 'E
600 GOSUB700:OL=2:GOSUB1050:AS$=AS$+" "+R$:RETURN
605 'F
610 GOSUB700:OL=3:AS$=AS$+" $":FORX=1TO2:GOSUB990:NEXTX:RETURN
615 '0X 4X 5X 6X 7X
620 IFLS$="0"THENAS$="NEG"ELSEIFLS$="3"THENAS$="COM"ELSEIFLS$="4"THENAS$="LSR"EL
SEIFLS$="6"THENAS$="ROR"ELSEIFLS$="7"THENAS$="ASR"ELSEIFLS$="8"THENAS$="ASL"ELSE
IFLS$="9"THENAS$="ROL"ELSEIFLS$="A"THENAS$="DEC"ELSEIFLS$="C"THENAS$="INC"
630 IFLS$="D"THENAS$="TST"ELSEIFLS$="E"THENAS$="JMP"ELSEIFLS$="F"THENAS$="CLR"
640 RETURN
645 'DATA $
650 D=PEEK(A):D$=HEX$(D):MS$=LEFT$(D$,1):LS$=RIGHT$(D$,1):IF LEN(D$)=1 THEN MS$=
"0"
660 HD$=HD$+MS$+LS$:RETURN
665 '8X 9X AX BX
670 IFLS$="0"THENAS$="SUBA"ELSEIFLS$="1"THENAS$="CMPA"ELSEIFLS$="2"THENAS$="SBCA
"ELSEIFLS$="3"THENAS$="SUBD"ELSEIFLS$="4"THENAS$="ANDA"ELSEIFLS$="5"THENAS$="BIT
A"ELSEIFLS$="6"THENAS$="LDA"ELSEIFLS$="7"THENAS$="STA"ELSEIFLS$="8"THENAS$="EORA
"
680 IFLS$="9"THENAS$="ADCA"ELSEIFLS$="A"THENAS$="ORA"ELSEIFLS$="B"THENAS$="ADDA"
ELSEIFLS$="C"THENAS$="CMPX"ELSEIFLS$="D"THENAS$="SR"ELSEIFLS$="E"THENAS$="LDX"EL
SEIFLS$="F"THENAS$="STX"
690 RETURN
695 'CX DX EX FX
700 IFLS$="0"THENAS$="SUBB"ELSEIFLS$="1"THENAS$="CMPB"ELSEIFLS$="2"THENAS$="SBCB
"ELSEIFLS$="3"THENAS$="ADDD"ELSEIFLS$="4"THENAS$="ANDB"ELSEIFLS$="5"THENAS$="BIT
B"ELSEIFLS$="6"THENAS$="LDB"ELSEIFLS$="7"THENAS$="STB"ELSEIFLS$="8"THENAS$="EORB
"
710 IFLS$="9"THENAS$="ADCB"ELSEIFLS$="A"THENAS$="ORB"ELSEIFLS$="B"THENAS$="ADDB"
ELSEIFLS$="C"THENAS$="LDD"ELSEIFLS$="D"THENAS$="STD"ELSEIFLS$="E"THENAS$="LDU"EL
SEIFLS$="F"THENAS$="STU"
720 RETURN
725 '10XX 11XX
730 IFLS$="0"THENA=I+1:GOSUB650 ELSE850
740 IF MS$="2" AND LS$<>"0"THEN GOSUB260:AS$="LB"+AS$+" ";OL=4:I=I+1:GOSUB910:I=
I-1:RETURN
750 IF D$="3F"THEN AS$="SWI2":OL=2
760 IF D$<"80"THEN RETURN ELSE IF MS$="8" THENGOSUB930:IF AS$<>"" THENAS$=AS$+"
#":OL=4:FOR X=2TO3:GOSUB990:NEXTX:RETURN
770 IFMS$="9"THENGOSUB930:IF AS$<>"" THENAS$=AS$+" $(DP)":OL=3:X=2:GOSUB990:RETU
RN
780 IFMS$="A"THENGOSUB930:IFAS$<>"" THENGOSUB1050:AS$=AS$+" "+R$:RETURN
790 IF MS$="B"THEN OL=4:GOSUB930:IF AS$<>"" THEN AS$=AS$+" $":FOR X=2TO3:GOSUB99
0:NEXTX:RETURN
800 IFMS$="C"THENOL=4:GOSUB950:IF AS$<>""THENAS$=AS$+" #":FORX=2TO3:GOSUB990:NEX
TX:RETURN
810 IF MS$="D"THENOL=3:GOSUB950:AS$=AS$+" $(DP)":X=2:GOSUB990:RETURN
820 IFMS$="E"THENOL=3:GOSUB950:IF AS$<>""THENGOSUB1050:AS$=AS$+" "+R$:RETURN
830 IFMS$="F"THENOL=4:GOSUB950:IF AS$<>""THENAS$=AS$+" $":FORX=2TO3:GOSUB990:NEX
TX
840 RETURN
845 '11XX
850 IF LS$="1"THEN A=I+1:GOSUB650 ELSE RETURN
860 IFD$="3F"THENAS$="SWI3":OL=2:RETURNELSEOL=3:IFMS$="8"GOSUB970:IF AS$<>""THEN
AS$=AS$+" #":OL=4:FORX=2TO3:GOSUB990:NEXT:RETURN
870 IF MS$="9"THENGOSUB970:IF AS$<>""THENAS$=AS$+" $(DP)":X=2:GOSUB990:RETURN
880 IFMS$="A"THENGOSUB970:IF AS$<>""THENGOSUB1050:AS$=AS$+" "+R$:RETURN
890 IFMS$="B"THEN GOSUB970:IFAS$<>""THEN OL=4:AS$=AS$+" $":FORX=2TO3:GOSUB990:NE
XTX
900 RETURN
905 'LONGBRANCH
910 C=0:FORX=1TO0STEP-1:A=I-X+2:GOSUB650:C=C+D*(1+X*255):NEXTX:IF C>32767 THEN C
=C-65536:AS$=AS$+"$"+HEX$(I+3+C) ELSE AS$=AS$+"$"+HEX$(I+3+C)
```



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920 RETURN
925 '10- 8X 9X AX BX
930 IFLS$="3"THENAS$="CMPD"ELSEIFLS$="C"THENAS$="CMPY"ELSEIFLS$="E"THENAS$="LDY"
ELSEIFLS$="F"THENAS$="STY"
940 RETURN
945 '10- CX DX EX FX
950 IFLS$="E"THENAS$="LDS"ELSEIFLS$="F"THENAS$="STS"
960 RETURN
965 '11- 8X 9X AX BX
970 IFLS$="3"THENAS$="CMPU"ELSEIFLS$="C"THENAS$="CMPS"
980 RETURN
985 'EXTRA DATA#
990 A=I+X:GOSUB650:AS$=AS$+MS$+LS$:RETURN
995 'DATAFIELD
1000 PRINT"LENGTH OF DATA FIELD ";X;:INPUTL:INPUT"TYPE (0)ADDRESS (1)TEXT (2)DAT
A (3)MIX";T:IFT=0THEN1020ELSEIFT=2OR T=3THEN1030
1010 AS$="":HD$="":A=I:FORY=1TOL:GOSUB650:IFD>127ORD=13OR D=0THENAS$=AS$+" "+CHR
$((D)AND127):GOSUB170:AS$="":HD$="":A=A+1:I=I+(A-I):NEXTY:RETURN ELSEAS$=AS$+" "
+CHR$(D):A=A+1:NEXTY:GOSUB170:I=I+(A-I):RETURN
1020 HD$="":AS$="$":A=I:FORY=1TOL:GOSUB650:AS$=AS$+MS$+LS$:IF Y=FIX(Y/2)*2 THEN
GOSUB170:AS$="$":HD$="":A=A+1:I=I+(A-I):NEXTY:RETURN ELSE A=A+1:NEXTY:I=I+(A-I):
RETURN
1030 IFT=2THEN1040ELSEFORW=1TOL:INPUTT:IFT=0THENL=2:GOSUB1020:W=W+1:NEXTW:RETURN
ELSEL=1:IFT=1THENGOSUB1010:NEXTW:RETURNELSEGOSUB1040:NEXTW:RETURN
1040 AS$="":HD$="":A=I:FORY=1TOL:GOSUB650:IFY=FIX(Y/8)*8THENGOSUB170:HD$="":A=A+
1:I=I+(A-I):NEXTY:RETURNELSEA=A+1:NEXTY:GOSUB170:I=I+(A-I):RETURN
1045 'INDEXED
1050 A=A+1:GOSUB650:RR=(D)AND 96)/32:IN=(D AND 16):PO=(D)AND 15):IF D<=127 TH
EN PL=0:GOTO1120
1060 IFPO>=0 AND PO<7OR PO=11 THEN PL=0:GOTO1140 ELSE IF PO=8OR PO=12 THEN PL=1:
GOTO1160 ELSE IF PO=7OR PO=10OR PO=14OR IN<>16AND PO=15 THENAS$="":R$="":RETURN
1070 PL=2:GOSUB1100:IF PO=13 THEN R$=",PCR"
1080 C=0:FOR X=1 TO 0 STEP-1:A=A+1:GOSUB 650:C=C+D*(1+X*255):NEXTX:IF C>32767 TH
EN C=C-65536:R$=STR$(C)+R$ ELSE R$="+"+STR$(C)+R$
1090 OL=OL+PL:GOTO1190
1095 'REG
1100 IF RR=0 THEN R$=",X" ELSEIF RR=1 THEN R$=",Y" ELSE IF RR=2 THEN R$=",U" ELS
EIF RR=3 THEN R$=",S"
1110 RETURN
1115 '5BIT
1120 GOSUB1100:C=(D)AND 31):IF C>15 THEN C=C-32:R$=STR$(C)+R$ ELSE R$="+"+STR$(
C)+R$
1130 OL=OL+PL:RETURN
1135 ',R ,+ +-
1140 GOSUB1100:IF PO=0 THEN R$=R$+"+" ELSE IF PO=1 THEN R$=R$+"++" ELSEIF PO=2 T
HEN R$=LEFT$(R$,1)+"-"+RIGHT$(R$,1) ELSEIF PO=3 THEN R$=LEFT$(R$,1)+"--"+RIGHT$(
R$,1) ELSEIF PO=5 THEN R$="B"+R$ ELSEIF PO=6 THEN R$="A"+R$ ELSEIF PO=11 THEN R$
="D"+R$
1150 OL=OL+PL:GOTO1190
1155 '8BIT
1160 GOSUB1100:IF PO=12 THEN R$=",PCR"
1170 A=A+1:GOSUB650:IF D>127 THEN C=D-256:R$=STR$(C)+R$ ELSE R$="+"+STR$(D)+R$
1180 OL=OL+PL:GOTO1190
1185 'INDIRECT
1190 IF IN=16 THEN IF PO=2 OR PO=0THENAS$="":R$="":RETURN ELSER$="["+R$+"]"
1200 IFPO=9OR PO=13 THEN RETURN
1210 IF PO=15 THENF$=HEX$(C+1)((SGN(C)=1)/2*65536):A=LEN(F$):IF A<4 THEN R$="[
$"+STRING$(4-A,48)+F$+"]" ELSE R$="[$"+F$+"]"
1220 RETURN
1225 'CC
1230 IFD>127 THEND=D-128ELSEHS$=HS$+"E"
1240 IFD>63THEND=D-64ELSEHS$=HS$+"F"
1250 IFD>31THEND=D-32ELSEHS$=HS$+"H"
1260 IFD>15THEND=D-16ELSEHS$=HS$+"I"
1270 IFD>7THEN D=D-8ELSE HS$=HS$+"N"
1280 IFD>3THEND=D-4ELSEHS$=HS$+"Z"
1290 IFD>1THEND=D-2ELSEHS$=HS$+"V"
1300 IFD>0THEND=D-1ELSEHS$=HS$+"C"
1310 RETURN
1315 'PUS-PUL
1320 HS$=HS$+" ":IFD>127 THEND=D-128:HS$=HS$+"PC,"
1330 IFD>63THEND=D-64:IFMID$(AS$,4,1)="S" THENHS$=HS$+"U,"ELSE HS$=HS$+"S,"
1340 IFD>31THEND=D-32:HS$=HS$+"Y,"
1350 IFD>15THEND=D-16:HS$=HS$+"X,"
1360 IFD>7THEND=D-8:HS$=HS$+"DP,"
1370 IFD>3THEND=D-4:HS$=HS$+"B,"
1380 IFD>1THEND=D-2:HS$=HS$+"A,"
1390 IFD=1THENHS$=HS$+"CC,"
1400 RETURN
1405 'EXG-TFR
1410 R$="":FORX=0TO1:IFX=0THEN C=VAL("&H"+MS$) ELSE C=VAL("&H"+LS$)
1420 IFC=0THENR$="D"ELSEIFC=1THENR$="X"ELSEIFC=2THENR$="Y"ELSEIFC=3THENR$="U"ELS
EIFC=4THENR$="S"ELSEIFC=5THENR$="PC"ELSEIFC=8THENR$="A"ELSEIFC=9THENR$="B"ELSEIF
C=10THENR$="CC"ELSEIFC=11THENR$="DP"
1430 IF R$<>"" THEN IFX=0THENF$=R$ELSET$=R$ ELSE AS$="":RETURN
1440 NEXTX:RETURN
```

◀ 730-900 are subroutines for the double byte opcodes. Lines 910-920 are a subroutine for working out long branches. Line 990 adds data for absolute or extended addresses. Lines 1000-1040 are the subroutine for data fields. Lines 1050-1220 decode the postbyte of indexed and indirect indexed and extended instructions.

Lines 1230-1310 label the bits for the CC register instructions. Lines 1320-1400 label registers for push and pull instructions. Lines 1410-1440 do the same for exchange and transfer instructions. R$ is used to name registers, F$ and T$ being used in EXG and TFR opcodes. IN is used as an indirect flag. PO is the postbyte index. PL is the postbyte additional length which is added to OL (opcode length). RR is the register index.

Results

When the results are printed, immediate data is prefixed by the £ or number sign, addresses by $. All relative addresses are calculated and direct addresses are printed $(DP) for the higher order byte. These are all printed in hex. Indexed displacements are in decimal.

When using formats in the data field routine, addresses are printed $---- as 16-bit hex numbers, text is printed as a continuous string followed by the characters and terminated by any of the following: null byte 00, CR byte OD, negated byte greater than 7F. Data is printed as a string of eight bytes or less (mix specifies each byte as one of the other three).

I will be happy to record a copy of the program for any readers interested. Send me a blank tape with sufficient postage for its return and a cheque for £3. My address is 18 Arksey Terrace, Leeds LS12 2NQ. ■

Add a new dimension to your Dragon

If you fancy links with the outside world,
***Leslie Miles** shows how to build an inexpensive interface.*

THERE ARE PROBABLY many Dragon owners who think that their machines should be capable of doing more than just display pretty pictures, and who want to experiment by interfacing with other types of displays and external devices. In fact, the Dragon is able to drive LEDs, motors, relays, etc, read input levels, and indeed perform any type of control function. The capabilities of the machine are virtually only limited by one's own ingenuity.

To achieve this extra terrestrial activity, as it were, the only requirement is an interface board to convert the signals from the Dragon data bus into electrical signals capable of operating any other electrical device. Anyone with a soldering iron and the will to spend a little time and trouble on making a good job of a small board, whether it be etched or put on a piece of Veroboard, can build such an interface for an outlay of £5 or so. Since there are so many variations on this theme, I can only describe the method in principle and leave the actual application to the individual's own requirements.

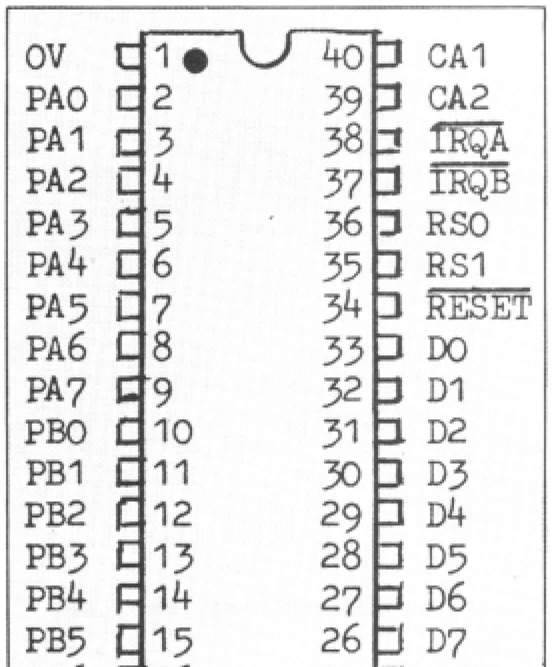


Figure 1: pin connections of the MC6821P

The heart of the interface is the Peripheral Interface Adapter chip (affectionately known as the PIA). Two of these are already built into the Dragon, one to input the keyboard information and the other to interface the cassette port. The joystick ports and sound output port are also serviced by these two built-in chips.

"The capabilities of the machine are virtually only limited by one's own ingenuity"

The PIA itself is a device that can be addressed by a unique address so that it is activated (or enabled). Being already connected to the computer data bus, it can have 8-bit data read into its registers for supplying signals to output devices, or have data in its registers read back into the computer. The CPU (central processing unit) in the computer generates the necessary R/W (read/write) signal on command from Basic to read from or write into the PIA. The PIA also has control lines that can be programmed to act as interrupt signals to inform the CPU that a change in the external circumstances has occurred or can be used as additional output lines.

The PIA that I shall use is the same as is in the Dragon, the Motorola MC6821P, which has two completely independent 8-bit input/output ports, any line of which can be programmed to act as an input or an output at will. A complete description of the 6821 would fill an article in itself and I would strongly advise anyone contemplating using the device to obtain information from Motorola to be able to appreciate its full potential. The company can be contacted at 17 Burnley Road, London NW10. The 6821 is advertised by Technomatic at less than £2.00.

Basically the 6821 contains two control registers, CRA and CRB, one for each port; two data direction registers, DDRA and DDRB, which determine which of the port lines PAO-PA7 and PBO-PB7 are set as inputs or outputs; and two output registers, ORA and ORB, which hold the in/out information. There are four control lines, CA1, CA2, CB1 and CB2, which can be programmed as either interrupt lines or in the case of CA2 and CB2 as additional output lines, depending on how the appropriate bits in the control registers are set.

The PIA is addressed by means of signals on lines CS0, CS1, CS2, RS0 and RS1. The chip is enabled when CS0 and CS1 are high and CS2 is low at the same time and the registers inside the chip are addressed by the state of RS0 and RS1. Lines R/W, E and RESET are CPU controlled signals that determine whether a read into or write from the chip is required, supply the clock signal and supply a reset signal respectively. Data is fed to and from the PIA via DO-D7 and interrupt signals into the CPU via IRQA and IRQB. The pin connections are shown in figure 1.

The link between the Dragon and the PIA is made via the expansion socket on the right-hand side of the console. This socket is a 20-way connector that will accept a double-sided PCB on 0.1 inch spacing. The pin connections are shown in figure 2. Making a suitable connector for the socket is probably the most expensive item in building the interface board. I used an RS Components 43-way edge plug cut down to 20-way. It costs about £5.00 and its part number is 468-709. This item accepts a single-sided PC board, the terminations being soldered directly to the copper tracks on one side and by wire links on the other. No doubt experimenters will devise their own method of making a connection to the expansion socket but I must stress that it is important to make a good connection and to check thoroughly that there are no shorts between any of the adjacent terminals because the result could be a screen full of garbage. The circuit joining the Dragon to the interface board is shown in figure 3.

As stated before CS0 and CS1 must be high (not less than 2 volts) and CS2 must be low (0.8 volts at most) to access ▶

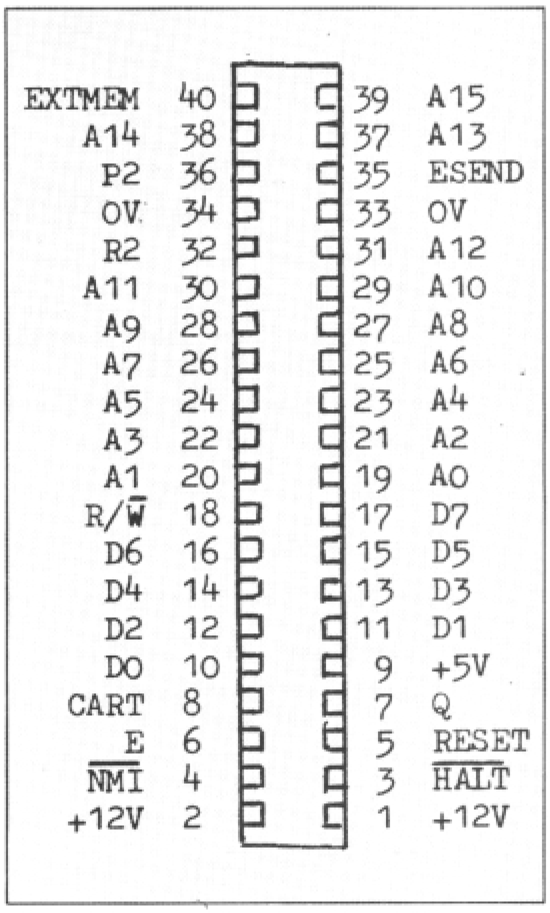


Figure 2: pin connections of expansion socket

MACE
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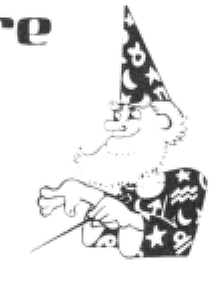


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◀ the PIA. With the design shown, and this is purely arbitrary, address line A15 is high, A14 and A13 are both high at the input to the '&' gate so that the output of the '&' gate is also high and A12 is low. This will correspond to an address with a high order byte of binary 1110 so any hexadecimal address that begins with a 'E' will switch the PIA on.

The two lowest bits of the address are connected to the register select lines and signals on these address bits will access the registers as shown in figure 4.

So if address &HE000 is put on the address lines by the CPU then either register ORA or DDRA is connected to the data bus, depending how bit 2 in control register ORA has previously been set. Similarly &HE001 will address CRA and addresses &HE002 and &HE003 will access the equivalent registers in section B of the PIA.

It might well be that you have an application that requires more than two ports. Another PIA may be added by using the extra logic shown in figure 5. We now have a situation where &HDXXX will address one PIA and &HEXXX will address the other. It is possible to go on like this for as many ports as required always provided that the lines from the expansion socket are suitably buffered against overloading.

You will note that the addresses I have used in the examples, namely 53248 to 53251 and 57344 to 57347 (quoting now in decimal), are in the cartridge memory space and will have no effect on any other location in the Dragon's memory map.

So much for the link between the Dragon and the external devices. How do we use this interface? I will give a simple example of what can be done and how a program may be written to control the input and output ports, and then you are on your own.

The PIA lines PAO to PA7 have pull-up resistors to +5 volts. Therefore, by connecting a bank of switches to these lines and putting the other side to 0 volts, it is possible to put a high or a low on these lines at will. Instead of using the interrupt outputs IRQA or IRQB, I will make use of one of the control lines CA1 to produce an interrupt indication. For this a momentary push-button switch is connected to pin 40 with a pull-up resistor to +5 volts so ▶

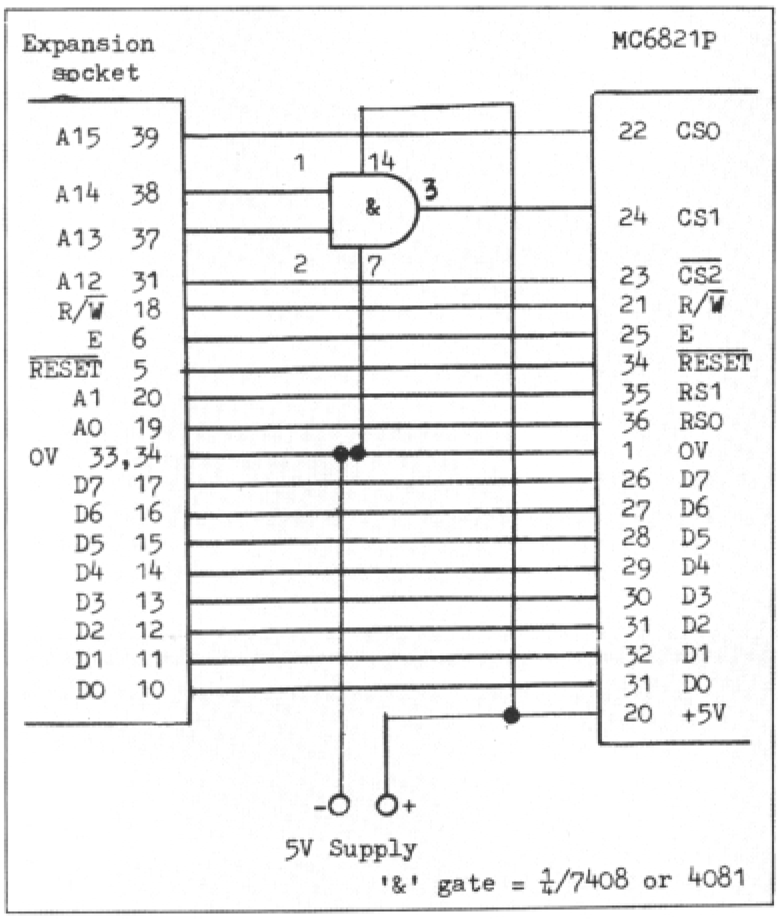
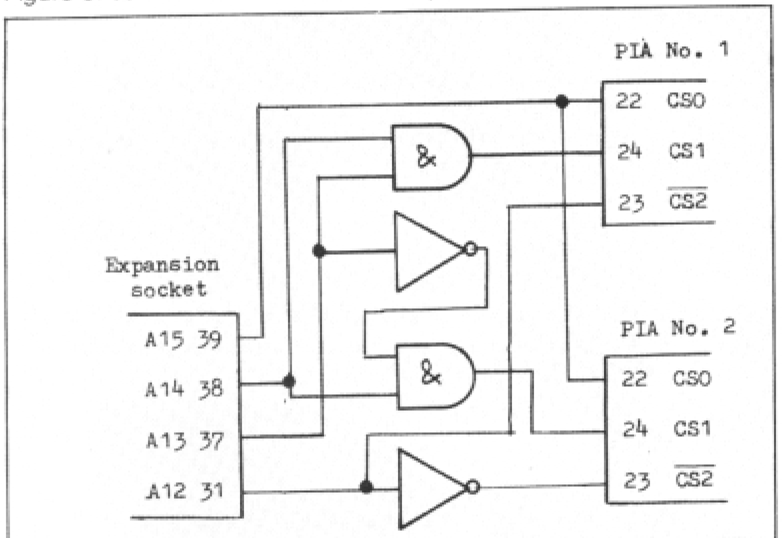


Figure 3: connections between the expansion socket and the PIA

RS1	RSO	CRA,bit2	CRB,bit2	Register selected
0	0	1	x	Output register A
0	0	0	x	Data direction register A
0	1	x	x	Control register A
1	0	x	1	Output register B
1	0	x	0	Data direction register
1	1	x	x	Control register B

x = either 0 or 1

Figure 4: internal addressing of PIA registers



Address				PIA.1				PIA.2			
A15	A14	A13	A12	CSO	CS1	CS2	state	CSO	CS1	CS2	state
1	1	1	0	1	1	0	ON	1	0	1	OFF
1	1	0	1	1	0	1	OFF	1	1	0	ON

Figure 5: connections for two PIAs

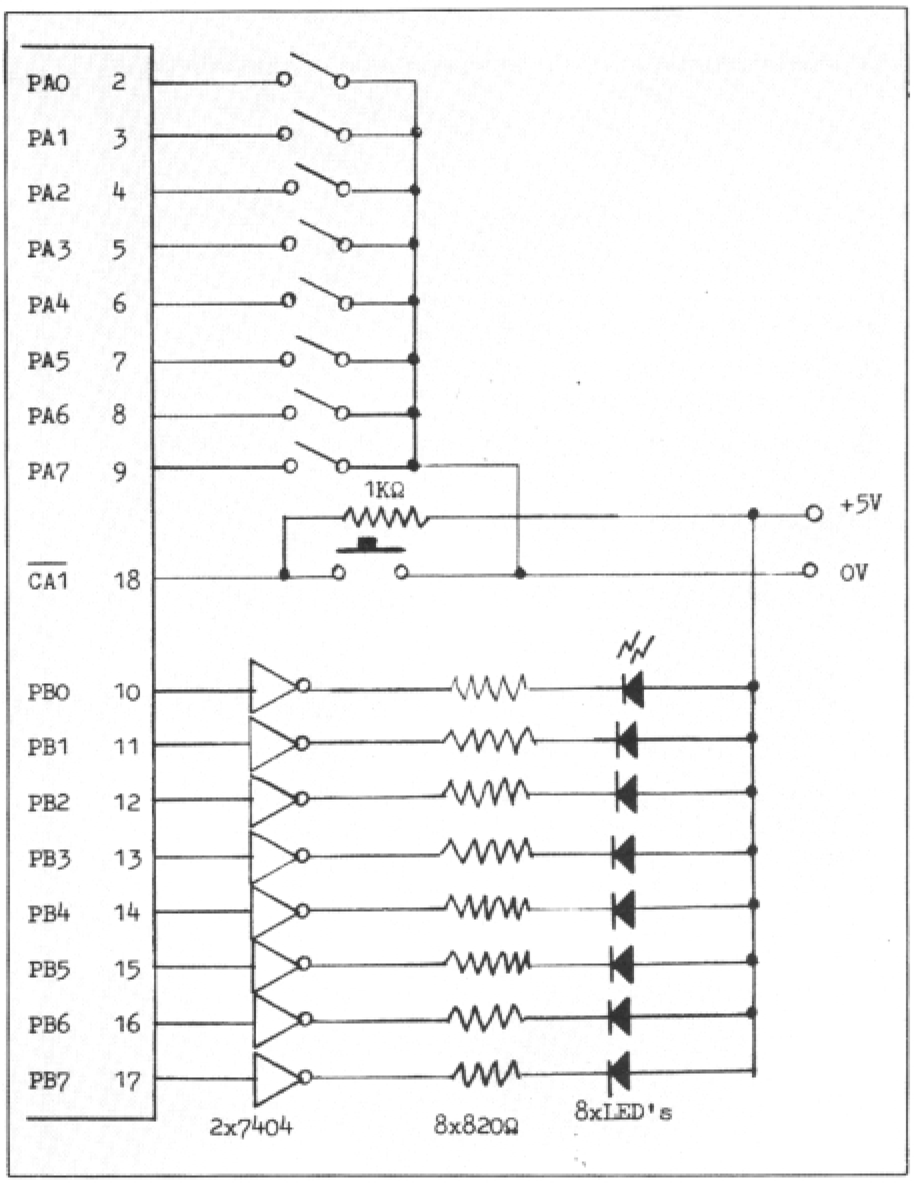


Figure 6: test circuit on output of PIA

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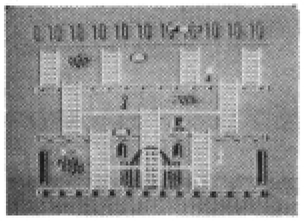
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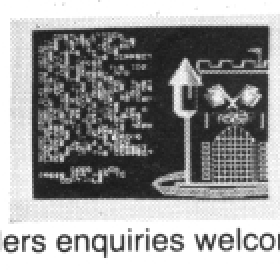


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◀ CA1 is high but can be pulsed low by operating the switch. Lines PB0 and PB7 are connected to LEDs via current limiting resistors. These will act as indicators to read out the results of the program. The circuit for the ports is shown in figure 6. I will explain the programming of the PIA as we go through each step.

A word of warning here: carefully check all the wiring for shorts, especially between the IC pins. Use a magnifying glass and then if you are not sure use a continuity tester. Also make sure that the Dragon is switched off before connecting anything into the expansion socket. When the interface is connected to the Dragon, switch both units on — if all is well you should be rewarded by seeing all 8 LEDs light up.

Now for the program:

10 P= 57344

Variable P is set to the base address of the PIA.

20 POKE P+2,255

When the PIA is first switched on all the registers are set to 0 (a reset also sets all bits to 0). We are addressing DDRA and in order to make the port lines act as inputs then the bits in the data direction registers must be set to a '1' (255 = &HFF = 11111111).

30 POKE P+3,4

A '1' is written into bit 2 of CRB (remember that the lowest bit is bit 0) which switches address P+2 to ORB.

40 POKE P+1,5

A '1' is written into bits 0 and 2 of CRA. This does two things: the '1' in bit 2 switches address P to ORA as line 30 did for section B, and the '1' in bit 0 enables and sets line CA1 as an interrupt input. If CA1 is now momentarily made low then bit 7 of CRA is set high. (There is a lot more associated with the control register bits not covered here.)

50 Q=PEEK (P+1)

CRA is read and the bit pattern stored as variable Q.

60 R=PEEK (P)

Similarly ORA is stored as variable R.

70 IF Q>128 THEN POKE P+2,R

"There really is no limit to the possibilities . . . There are so many devices available on the market"

If an interrupt has occurred, ie if CA1 switch has been operated once, there will be a '1' in bit 7 as well as the '1's put in by line 40. So CRA would have contained 133 when line 50 read it. I say "would have" because when line 60 reads the output register it automatically clears bit 7 back to 0 ready for another interrupt. R now contains the setting as for the switches on the input port, and if the condition is met this setting is put into ORB and the LEDs lit accordingly. However, if no interrupt has occurred then line 70 is ignored.

80 GOTO 50

This puts the program in and endless loop. The appropriate LEDs will remain lit until such time that the port switches are changed but the new setting will only be reflected in the LEDs when switch CA1 is operated.

This simple program demonstrates how input levels on the input port lines are translated into output levels on another port. As there is a computer between these two ports then all sorts of conditions may be built in. For example, maybe you only want LED 2 to light up when the switches are set to a bit setting of, say, 11001100. Again FOR . . . NEXT delay loops may be built into the program to make LEDs flash on and off. There really is no limit to the possibilities. You may want to read inputs from a remote infrared transmitter to drive a logic-controlled tape recorder. The LEDs may be replaced by transistors that drive power devices like relays.

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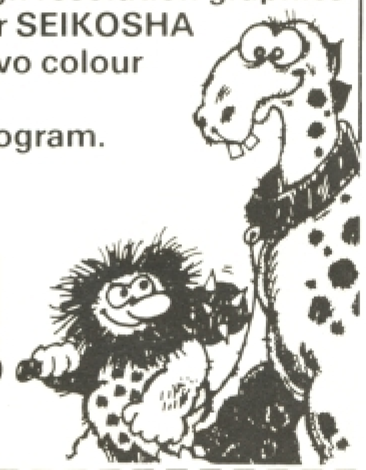
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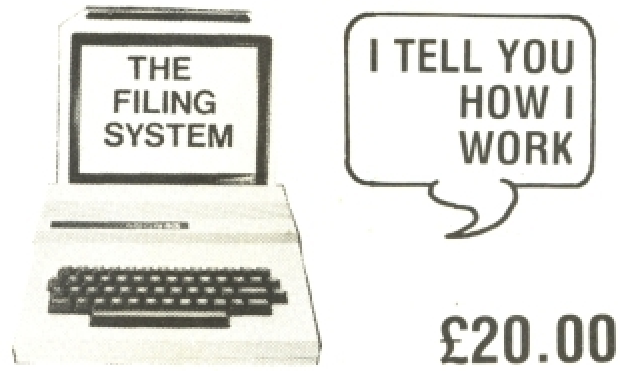
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Sketching

From R Steel in Gwynedd

USING THE right-hand joystick, this program enables you to draw pictures in high resolution graphics. When the joystick button is pressed, the screen will be cleared and drawing will begin again from the point where the previous sketch ended.

10	Sets the screen to high resolution.
20	Co-ordinates for starting point of drawing dot.
30	Tests the position of the joystick and allocates the values to C and D.
40	Draws a line from AB to CD.
50	Resets the co-ordinates A and B at C and D.
60	Tests if the joystick button has been pressed, and, if so, clears the screen.

```
1Ø    PMODE 4,1:SCREEN 1,1:PCLS
2Ø    A=128:B=96
3Ø    C=JOYSTK(Ø):D=JOYSTK(1)
4Ø    LINE (A,B)-(C*4,D*4),PSET
5Ø    A=C*4:B=D*4
6Ø    E=PEEK(6528Ø):IF E=126
      OR E=254 THEN PCLS
7Ø    GOTO 3Ø
```

Squash

From I ap Gwynn in Aberystwyth

IN THIS GAME the ball passes through the bat when it is not your turn to hit it. Getting the bat into the correct position can be quite tricky on diagonal shots and some practice is required. Points are gained when a player fails to hit the ball and allows it to reach the 'back' wall.

In order to speed up the game several measures have been taken. Higher speed operation is selected in line 350. In lines 300-340 all variables are assigned values so that these do not have to be calculated each time they are needed. None of the NEXTs in the FOR loops carry a variable name, giving a significant increase in speed. Frequently called GOTO and GOSUB lines are assigned low numbers, in order to speed up finding them.

The main game movements are controlled between lines 20-220. Rebound directions are present in lines 240-290. If the game is stopped by pressing the BREAK key for any reason then be sure to press the RESET button before using tape.

```
10 GOTO 300:' SQUASH c I.AP GWYNN 5/83
20 IF M1+PC < M1 OR M1+PC > 1535 THEN RETURN ELSE FOR I=A0 TO A3:JO(I)=JOYSTK(I):NEXT
30 BN(A1)=(INT(JO(A1)/4)*32)+(INT(JO(A0)/A2))
40 BN(A2)=(INT(JO(A3)/4)*32)+(INT(JO(A2)/A2))
50 POKE M1+BP(A1),M2:BP(A1)=BN(A1):POKE M1+BP(A1),M3
60 POKE M1+BP(A2),M2:BP(A2)=BN(A2):POKE M1+BP(A2),M4
70 ON FL GOSUB 240,250,260,270,280,290
80 IF DI=A0 THEN 160
90 IF PN>A0 AND PN<D1 THEN FL=A3:GOTO 120
100 IF PN>B5*D2 AND PN<(B5*D2)+D1 THEN FL=A1:GOTO 120
110 FOR X=D TO M5 STEP D2:IF PN=X THEN 140 ELSE NEXT
120 POKE M1+PC,M2:PC=PN:POKE M1+PC,M6:GOTO 20
130 POKE M1+PC,M2:PC=PN:POKE M1+PC,M6
140 FL=A3+RND(A3):DI=A0:SOUND CA,A2
150 GOTO 20
160 IF PN>A0 AND PN<D1 THEN FL=A4:GOTO 220
170 IF PN>B5*D2 AND PN<(B5*D2)+D1 THEN FL=A6:GOTO 220
180 FOR X=A0 TO B5:IF PN=X*D2 THEN RETURN ELSE NEXT
190 IF R=A1 THEN 210
200 IF PEEK(M1+PN)=M3 THEN FL=A2:DI=A1:R=A1:S=1:SOUND CB,A2:GOTO 20
210 IF PEEK(M1+PN)=M4 THEN FL=A2:DI=A1:R=A2:S=A2:SOUND CC,A2:GOTO 20
220 POKE M1+PC,M2:PC=PN:POKE M1+PC,M6:GOTO 20
230 ' DIRECTIONS
240 PN=PC-D1:RETURN
250 PN=PC+A1:RETURN
260 PN=PC+D3:RETURN
270 PN=PC+D1:RETURN
280 PN=PC-A1:RETURN
```

Continued on page 40

```
290 PN=PC-D3:RETURN
300 A0=0:A1=1:A2=2:A3=3:A4=4:A6=6:B1=11
310 B5=15:M1=1024:M2=143:M3=150:M4=249
320 D2=32:CA=100:CB=83:CC=150:M5=511:M6=128
330 D1=31:D3=33
340 MA(1)=0:MA(2)=0:SC(1)=0:SC(2)=0:S=RND(2):R=S
350 POKE&HFFD7,0:'SET HIGH SPEED
360 CLS8
370 PRINT@(3*32)+10,"SQUASH"
380 PRINT@(5*32)+5,"TO PLAY THIS GAME YOU WILL NEED BOTH JOYSTICKS"
390 PRINT@(7*32)+5,"EACH GAME IS SCORED TO 11        THE FIRST TO SCORE 11 WINS GAME"
400 PRINT@(10*32),"";:INPUT"NAME OF RH PLAYER:";RH$
410 PRINT@(12*32),"";:INPUT"NAME OF LH PLAYER:";LH$
420 GOSUB 700
430 IF SC(1)=11 THEN MA(1)=MA(1)+1
440 IF SC(2)=11 THEN MA(2)=MA(2)+1
450 GOSUB 570
460 GOTO 420
470 ' START
480 FL=2
490 FOR I=0 TO 3:JO(I)=JOYSTK(I):NEXT
500 IF S=2 THEN 540
510 BP(1)=(INT(JO(1)/4)*32)+(INT(JO(0)/2))
520 PC=BP(1)+1
530 RETURN
540 BP(2)=(INT(JO(3)/4)*32)+(INT(JO(2)/2))
550 PC=BP(2)+1
560 RETURN
570 ' SCOREBOARD ROUTINE
580 CLS7
590 PRINT@64+10,"SCOREBOARD"
600 PRINT@128+3,RH$:PRINT@128+22,LH$
610 PRINT@192+3,MA(1):PRINT@192+12,"GAMES":PRINT@192+22,MA(2)
620 PRINT@256+12,"POINTS"
630 PRINT@288+3,SC(1):PRINT@288+12,"LAST":PRINT@288+22,SC(2)
640 PRINT@320+12,"GAME"
650 PRINT@418,"PRESS BUTTON TO CONTINUE"
660 FOR I=0 TO 31:POKE 1024+I,201:POKE 1024+(15*32)+I,201:NEXT
670 FOR I=0 TO 15:POKE 1024+(I*32),201:POKE 1024+(I*32)+31,201:NEXT
680 PK=PEEK(65280)
690 IF PK=126 OR PK=254 OR PK=125 OR PK=253 THEN RETURN ELSE 680
700 ' START GAME
710 CLS5
720 PRINT@226,"START GAME?Y/N":Q$=INKEY$
730 IF Q$="" THEN 720
740 IF Q$<>"Y" THEN 860
750 ON S GOTO 760,770
760 PRINT@352,RH$:GOTO 780
770 PRINT@352,LH$
780 PRINT"TO SERVE-PRESS BUTTON"
790 GOSUB 680
800 GOSUB 470
810 CLS:DI=1:GOSUB 20
820 IF S=1 THEN SC(1)=SC(1)+1
830 IF S=2 THEN SC(2)=SC(2)+1
840 IF SC(1)=11 OR SC(2)=11 THEN RETURN
850 CLS:GOTO 750
860 GOSUB 570
870 CLS
880 IF MA(1)>MA(2) THEN PRINT@5*32,RH$" HAS WON!!":GOTO 910
890 IF MA(1)=MA(2) THEN PRINT@5*32,"MATCH DRAWN":GOTO 910
900 PRINT@5*32,LH$" HAS WON!!"
910 PRINT@10*32,"****MATCH FINISHED****"
920 FOR I=0 TO 10000:NEXT
930 POKE&HFFD6,0:'RESET SPEED
940 END
```

Pontoon

From I Saunders in Wigan

THIS PROGRAM IS a game for one player against the computer. The idea is to get 21 or as near to 21 as possible. Should the total score of your cards beat the total score of the computer's cards you are awarded a point; vice versa should the computer's total beat yours. Should you bust or your total equals the computer's, the computer wins. The player is allowed a maximum of five cards; the computer is allowed only two and therefore cannot bust.

The game is simple to operate and the graphics are used to display the cards. One card from both the player's hand and the computer's hand is shown. Another card only from the player's hand is then revealed. The player is asked whether he would like another card. If yes is the answer another card is revealed. Should he refuse to take a card and he hasn't bust, the other card from the computer's hand is revealed. The winner obtains a point while a comment appears on the screen. The score from both parties is then displayed on the screen and the player is asked whether or not he would like another game.

An ace displayed is equal to 11 not one or 11. Another point worth mentioning is the fact that the game is speeded up using the command POKE 65495,0. It is advisable not to break the game but wait until you are asked ANOTHER GAME (Y/N) as the POKE will stop the cassette recorder working.

```
1 REM ***** pontoon *****
2 REM *** I. SAUNDERS ***
3 REM *** 27 / 6 / 83 ***
4 REM * USING A CGP-115 *
5 REM ******************
10 U=0
20 CH=0:YH=0
30 REM*BUILD ARRAYS*
40 DIM S$(5),N$(13),D(52),P(5),C(5)
50 DATA 16,32,48,96,1
60 DATA *ACE**,*TWO**,THREE*,*FOUR*,*FIV
E*,*SIX**,SEVEN*,*EIGHT*,*NINE*,*TEN**,*
JACK*,QUEEN*,*KING*
65 POKE 65495,0
70 FOR X=1 TO 5:READ S:S$(X)=CHR$(143+S)
:NEXT X
80 FOR X=1 TO 13: READ N$:N$(X)=N$:NEXT
X
90 CLS 6
100 PT=0:CT=0:U=U+1
110 FOR X=1 TO 5:P(X)=0:C(X)=0:NEXT
120 PRINT@65,"pontoon";
130 PRINT@129,"GAME ";U;
140 FOR X=1 TO 52:D(X)=X:NEXT X
150 FOR X=1 TO 5:GOSUB 1000:P(X)=Z:NEXT
X
160 FOR X=1 TO 2:GOSUB 1000:C(X)=Z:NEXT
X
170 REM ** PRINT PLAYERS HAND **
180 L=257
190 FOR M=1 TO 2:C=P(M):GOSUB 550:PT=PT+
T:NEXT
200 FOR M=1 TO 3:S=5:GOSUB 2000:NEXT
210 REM ** PRINT COMPUTERS HAND **
220 L=10
230 S=5:GOSUB 2000
240 C=C(2):GOSUB 550:CT=CT+T
250 PRINT@8,"COMPUTERS HAND";
260 PRINT@267,"YOUR HAND";
270 L=269:K=3
280 PRINT@230,"ANOTHER CARD(Y/N)?";
290 R$=INKEY$:IF R$="" THEN 290
300 IF R$="N" THEN 380
310 C=P(K):GOSUB550
320 PT=PT+T
330 IF PT>21 THEN CLS4:PRINT@230,"SORRY!
 YOU BUST";:FOR A=1 TO 1000:NEXT A:CH=CH
+1:GOSUB 5010:GOTO 500
340 FOR X=1 TO K
350 IF PT>21 AND (P(X)-1)/13=INT((P(X)-1
)/13) THEN PT=PT-10
360 NEXT X
370 K=K+1:IF K<6 THEN 280
380 L=10
390 C=C(1):GOSUB 550:CT=CT+T
400 FOR A=1 TO 2000:NEXT A
405 REM ** COMPUTE WHO AS WON **
410 IF PT=21 THEN CLS3:PRINT@66,"YOU WIN
...21 ON THE BUTTON";:FOR A=1 TO 1000:NE
XT A:YH=YH+1:GOSUB 5010:GOTO 500
420 IF CT=21 THEN CLS 3:PRINT@70,"SORRY!
 I WIN 21 DEAD";:FOR A=1 TO 1000:NEXT A:
CH=CH+1:GOSUB 5010:GOTO 500
430 IF CT>=PT THEN CLS 4:PRINT@164,"I WI
N THAT ONE";:CH=CH+1:FOR A=1 TO 1000:NEX
T A:GOSUB 5010:GOTO 500
440 IF PT> CT THEN CLS 4:PRINT@164,"ONE
TO YOU";:FOR I=1 TO 1000:NEXT I
450 YH=YH+1
460 GOSUB 5010
470 GOTO 500
480 REM
500 REM ** ANOTHER GAME **
510 CLS 3
520 PRINT@70,"ANOTHER GAME (Y/N)";
530 A$=INKEY$:IF A$="Y" OR A$="N" THEN 5
40 ELSE 530
540 IF A$="Y" THEN 90 ELSE IF A$="N" THE
N POKE 65494,0:END
550 GOSUB 4000:GOSUB 2000
560 GOSUB 3000
1000 REM** DEAL THE CARDS **
1010 Z=RND(52)
1020 IF D(Z)=0 THEN 1000
1030 D(Z)=0
1040 RETURN
2000 REM** PRINT THE SUITS **
2010 L1=L
2020 FOR X=1 TO 6
2030 L1=L1+32
2040 FOR Y=1 TO 5
2050 PRINT@L1+(Y-1),S$(S);
2060 NEXT Y,X
2070 L1=0:L=L+6
2080 RETURN
3000 REM** PRINT THE NUMBERS **
3010 L1=L-6
3020 FOR X=1 TO 6
```

Continued on page 43

```
3030 L1=L1+32
3040 PRINT@L1+2,MID$(N$(N),X,1);
3050 NEXT X
3060 L1=0
3070 RETURN
4000 REM** COMPUTE NUMBER AND SUIT **
4010 S=INT((C-1)/13)+1
4020 N=C-(S*13-13)
4030 REM ** COMPUTE CARD VALUE **
4040 IF N=11 OR N=12 OR N=13 THEN T=10 ELSE T=N
4050 IF N=1 THEN T=11
4060 RETURN
5000 REM ** COMPUTE YOUR SCORE & COMPUTERS SCORE **
5010 CLS 0
5020 PRINT@67,"YOUR SCORE";YH;
5030 PRINT@131,"COMPUTER'S SCORE";CH;
5040 FOR M=1 TO 1000:NEXT M
5050 RETURN
```

Yahtzee

From David Horton in Peterborough

YOU MAY HAVE played Waddington's game Yahtzee with five dice, pen and paper. Now it's on the television.

I have tried to keep as close to the original game as possible. One change is that no score is not to blank off a line on the display, but goes unfilled after 13 goes. Up to four players may play (more can play if you change lines 20, 30, 60, but this makes the game too long to play). A player throws five dice to fill the score screen. You may save any of the five dice or none of them on the first two goes. The third throw is saved by the computer. The computer works out your score and displays it. Then the next player's name and score is displayed.

Program notes

Lines	
30-80	Number of players and their names.
90-150	Introduction of game.
170-190	Display name of player who is next.
200	Scorecard displayed.
210-250	Roll dice routine.
270-350	Input save or unsave.
370-410	Process save input.
430-450	Display, save dice.
470-520	Process unsave input.
540-640	Process dice to number of 1s, 2s, 3s, 4s, 5s and 6s.
660-1220	Find out if score will fit score card display.
1240-1400	Display score card.
1420-1480	Reset (dice, number, save, total).
1500	Check to see if any goes left.
1520-1570	Final scores for each finished player.

Arrays

D (1) = Number of players
AS (4) = Name of players
GT (4) = Goes (one to 13)
SA (5) = Saved dice
DI (5) = RND dice
SI (5) = Saved (1), not saved (0)
N (6) = Number of 1s, 2s, 3s, 4s, 5s, 6s
TL (4) = Total score

Variables

PL = Next player
SF = Score used (1), not used (0)
Score = SA (5) + (4) + (3) + (2) + (1)
T = three throws of dice

```
10 '************************          * YAHTZEE WRITTEN BY  *          * D.A.HORTON
.83/001/01*          ************************
20 DIM DI(5),A$(4),SI(5),SA(5),D(1),N(6),SC(13,4),TL(4),GT(4)
30 CLS3:PRINT@128,"HOW MANY PLAYERS (1-4)"
40 A=0:A$=INKEY$:IF A$=""THEN40
50 A=VAL(A$):D=A:D(1)=A
60 IFA<1ORA>4THENPRINT"ENTER 1 TO 4 ONLY":GOTO30
70 FORI=1TOD:CLS7:PRINT@64,"   PLAYER ";I;",":PRINT"WHAT IS YOUR NAME";
80 INPUTA$(I):NEXTI:CLS4
90 PRINT"           YAHTZEE."
100 PRINT@64," IN THIS GAME YOU HAVE 5 DICE."
110 PRINT@128," YOUR SCORE CARD IS SHOWN FIRST  THEN YOU ROLL THE DICE."
120 PRINT@224," YOUR SCORE IS DONE FOR YOU BY   THE COMPUTER."
130 PRINT@320," YOU SCORE ONLY 13 TIMES.             (+1 IF YAHTZEE SCORED)."
140 PRINT@416,"     PRESS ANY KEY"
150 IF INKEY$=""THENGOTO150ELSE170
160 '*******DICE ROUTINE********
170 CLS3:FORPL=1TOD(1)
180 LETGT(PL)=GT(PL)+1:IF GT(PL)>13THENGOTO1500
190 PRINT@160," THE NEXT SCORE CARD IS ";A$(PL);"'S.":FOR PAUSE=1TO2000:NEXT PAU
SE:CLS
200 LET DISPLAY=0:GOTO1210
210 PRINT:PRINT TAB(3)A$(PL);" TO ROLL DICE"
220 FOR T=1TO3:PRINT TAB(5)"THIS IS THROW ";T:
230 PRINT:FOR D=1TO5:IFSI(D)=1THENPRINT"   DICE ";D;"saved";SA(D)ELSEDI(D)=RND(6
):PRINT"   DICE ";D;" THROW ";DI(D)
240 NEXT D
250 IF T>2THENGOTO340
260 '****SAVE & UNSAVE?*******
270 PRINT:LINEINPUT"   DO YOU WISH SAVE  DICE Y/N";Z$
280 IF Z$="Y"THENGOSUB360
290 IFZ$="Y"THENGOSUB430
300 PRINT:LINEINPUT" DO YOU WISH TO UNSAVE DICE Y/N";X$
310 IFX$="Y"THENGOSUB460
320 IFX$="Y"THENGOSUB430
330 CLS
340 NEXT T
```

Continued on page 44

```
350 FOR PAUSE=1TO3000:NEXT:GOTO530
360 '*****SAVE ROUTINE********
370 FOR S=1TO5
380 IFSI(S)=1THENPRINT"   DICE ";S;" saved";SA(S)ELSE PRINT "   DICE ";S;" SAVE Y/N";:INPUT S$
390 IFS$="Y"THENSI(S)=1:SA(S)=DI(S)
400 NEXT:RETURN
410 IF N(2)=3 AND SC(2,(PL))=0 THEN SC(2,(PL))=6
420 '*****DISPLAY SAVED ROUTINE
430 CLS
440 PRINT:FOR L=1TO5:IF SI(L)=1THENPRINT"   DICE ";L;" saved ";SA(L)ELSEPRINT" DICE ";L;" not"+CHR$(128)+"saved"
450 NEXT L:FOR PAUSE=1TO200:NEXT:RETURN
460 '*****UNSAVE ROUTINE******
470 FOR US=1TO5
480 IFSI(US)=0THENPRINT"    DICE ";US;"not"+CHR$(128)+"saved"ELSEPRINT"    DICE ";US;:INPUT"UNSAVE Y/N";SU$
490 IF SU$="Y"THENLET SI(US)=0
500 NEXT US
510 FOR PAUSE=1TO2000:NEXT:CLS
520 RETURN
530 '*****SCORE**************
540 FOR SC=1TO5:IFSI(SC)=0THENLET SA(SC)=DI(SC)
550 NEXT SC
560 LET SCORE=SA(1)+SA(2)+SA(3)+SA(4)+SA(5)
570 '******DICE COUNT******
580 FOR T=1TO5
590 IFSA(T)=1THENN(1)=N(1)+1
600 IFSA(T)=2THENN(2)=N(2)+1
610 IFSA(T)=3THENN(3)=N(3)+1
620 IFSA(T)=4THENN(4)=N(4)+1
630 IFSA(T)=5THENN(5)=N(5)+1
640 IFSA(T)=6THENN(6)=N(6)+1
650 NEXT T
660 '******YAHTZEE?*********
670 FOR Y=1TO6
680 IFN(Y)=5ANDSC(12,(PL))=0THENSC(12,(PL))=50:GT(PL)=GT(PL)-1:SF=1:GOTO710
690 IFN(Y)=5ANDSC(12,(PL))>0ANDSF=0THENSC(12,(PL))=SC(12,(PL))+100:GT(PL)=GT(PL)-1:SF=1
700 NEXT Y
710 '*****HIGH STRAIGHT******
720 IF SF=1THEN1210
730 IFN(1)=1ANDN(2)=1ANDN(3)=1ANDN(4)=1ANDN(5)=1ANDN(6)=0ORN(1)=0ANDN(2)=1ANDN(3)=1ANDN(4)=1ANDN(5)=1ANDN(6)=1THENSC(11,(PL))=40:SF=1
740 '******LOW STRAIGHT.*******
750 IF SF=1THEN1210
760 IFN(1)=1ANDN(2)=1ANDN(3)=1ANDN(4)=1ANDN(5)=1ANDN(6)=0ORN(1)=0ANDN(2)=1ANDN(3)=1ANDN(4)=1ANDN(5)=1ANDN(6)=1THEN IF SC(10,(PL))=0THEN SC(10,(PL))=30:SF=1
770 IFN(1)=0ANDN(2)>0ANDN(3)>0ANDN(4)>0ANDN(5)>0ANDN(6)=0THEN IF SC(10,(PL))=0THENSC(10,(PL))=30:SF=1
780 IFN(1)>0ANDN(2)>0ANDN(3)>0ANDN(4)>0ANDN(5)=0ANDN(6)=>0 OR N(1)=>0ANDN(2)=0ANDN(3)>0ANDN(4)>0ANDN(5)>0ANDN(6)>0THENIFSC(10,(PL))=0THENSC(10,(PL))=30:SF=1
790 '*****FOUR FOR 1 TO 6******
800 IF SF=1THEN1210
810 FOR A=1TO6
820 IF N(A)=4ANDSC(A,(PL))=0THENSC(A,(PL))=A*4:SF=1
830 NEXT A
840 '*****FOUR OF A KIND******
850 IF SF=1THEN1210
860 FOR A=1TO6
870 IFN(A)=4ANDSC(A,(PL))>0THEN IF SC(8,(PL))=0THENSC(8,(PL))=SCORE:SF=1
880 NEXTA
890 '*********FULL HOUSE*********
900 IF SF=1THEN1210
910 FORY=1TO6
920 FORX=1TO6
930 IFN(X)=3ANDN(Y)=2THEN IFSC(9,(PL))=25THENGOTO950ELSE SC(9,(PL))=25:SF=1
940 NEXTX:NEXTY
950 '****THREE FOR 1 TO 6******
960 IF SF=1THEN1210
970 FOR A=1TO6
980 IF N(A)=3 AND SC(A,(PL))=0THENSC(A,(PL))=A*3:SF=1
990 NEXT A
```

```
1000 '********THREE OF A KIND***          1010 IFSF=1THEN1210          1020 FORA=1TO6
1030 IFN(A)=3ORN(A)=4ANDSC(A,(PL))>0THEN IF SC(7,(PL))=0THEN SC(7,(PL))=SCORE:SF
=1
1040 NEXT A
1050 '***LOW SCORE ON 1 TO 6****
1060 IFSF=1THEN1210
1070 IFN(1)=2ANDSCORE<20ANDSC(1,(PL))=0ORN(1)=2ANDSC(1,(PL))=0ANDSC(13,(PL))>0TH
ENSC(1,(PL))=2:SF=1:GOTO1210
1080 IFN(1)=1ANDSCORE<20ANDSC(1,(PL))=0ORN(1)=1ANDSC(1,(PL))=0ANDSC(13,(PL))>0TH
ENSC(1,(PL))=1:SF=1:GOTO1210
1090 IFN(2)=2ANDSCORE<20ANDSC(2,(PL))=0ORN(2)=2ANDSC(2,(PL))=0ANDSC(13,(PL))>0TH
ENSC(2,(PL))=4:SF=1:GOTO1210
1100 IFN(2)=1ANDSCORE<20ANDSC(2,(PL))=0ORN(2)=1ANDSC(2,(PL))=0ANDSC(13,(PL))>0TH
ENSC(2,(PL))=2:SF=1:GOTO1210
1110 IFN(3)=2ANDSCORE<20ANDSC(3,(PL))=0ORN(3)=2ANDSC(3,(PL))=0ANDSC(13,(PL))>0TH
ENSC(3,(PL))=6:SF=1:GOTO1210
1120 IFN(4)=2ANDSCORE<20ANDSC(4,(PL))=0ORN(4)=2ANDSC(4,(PL))=0ANDSC(13,(PL))>0TH
ENSC(4,(PL))=8:SF=1:GOTO1210
1130 IFN(3)=1ANDSCORE<20ANDSC(3,(PL))=0ORN(3)=1ANDSC(3,(PL))=0ANDSC(13,(PL))>0TH
ENSC(3,(PL))=3:SF=1:GOTO1210
1140 IFN(4)=1ANDSCORE<20ANDSC(4,(PL))=0ORN(4)=1ANDSC(4,(PL))=0ANDSC(13,(PL))>0TH
ENSC(4,(PL))=4:SF=1:GOTO1210
1150 IFN(5)=2ANDSCORE<20ANDSC(5,(PL))=0ORN(5)=2ANDSC(5,(PL))=0ANDSC(13,(PL))>0TH
ENSC(5,(PL))=10:SF=1:GOTO1210
1160 IFN(6)=2ANDSCORE<20ANDSC(6,(PL))=0ORN(6)=2ANDSC(6,(PL))=0ANDSC(13,(PL))>0TH
ENSC(6,(PL))=12:SF=1:GOTO1210
1170 IFN(5)=1ANDSCORE<20ANDSC(5,(PL))=0ORN(5)=1ANDSC(5,(PL))=0ANDSC(13,(PL))>0TH
ENSC(5,(PL))=5:SF=1:GOTO1210
1180 IFN(6)=1ANDSCORE<20ANDSC(6,(PL))=0ORN(6)=1ANDSC(6,(PL))=0ANDSC(13,(PL))>0TH
ENSC(6,(PL))=6:SF=1:GOTO1210
1190 IFSCORE>=20ANDSC(13,(PL))=0THENSC(13,(PL))=SCORE:SF=1:GOTO1210
1200 IFSCORE<20ANDSC(13,(PL))=0THENSC(13,(PL))=SCORE:SF=1
1210 '********TOTAL SCORE*******
1220 FOR ADD=1TO6:TL(PL)=TL(PL)+SC(ADD,(PL)):NEXT
1230 '*******DISPLAY CARD******
1240 CLS
1250 PRINT@0," aces.....(3 OR MORE).SCORE=";SC(1,(PL))
1260 PRINT@32," twos.....(3 OR MORE).SCORE=";SC(2,(PL))
1270 PRINT@64," threes...(3 OR MORE).SCORE=";SC(3,(PL))
1280 PRINT@96," fours....(3 OR MORE).SCORE=";SC(4,(PL))
1290 PRINT@128," fives....(3 OR MORE).SCORE=";SC(5,(PL))
1300 PRINT@160," sixs.....(3 OR MORE).SCORE=";SC(6,(PL))
1310 IFTL(PL)=>63THENTL(PL)=TL(PL)+35:PRINT@192," TOTAL ";TL(PL);"bonus"+CHR$(12
8)+"added"ELSEPRINT@192," TOTAL ";TL(PL)
1320 PRINT@224," three"+CHR$(128)+"of"+CHR$(128)+"kind(3SAME).SCORE=";SC(7,(PL))
1330 PRINT@256," four"+CHR$(128)+"of"+CHR$(128)+"kind.(4SAME).SCORE=";SC(8,(PL))
1340 PRINT@288," full"+CHR$(128)+"house.....(2+3).SCORE=";SC(9,(PL))
1350 PRINT@320," lstraight.(SEQUENCE).SCORE=";SC(10,(PL))
1360 PRINT@352," hstraight.(SEQUENCE).SCORE=";SC(11,(PL))
1370 PRINT@384," yahtzee..(5 OF KIND).SCORE=";SC(12,(PL))
1380 PRINT@416," chance...(ALL COUNT).SCORE=";SC(13,(PL))
1390 FOR PAUSE=1TO4000:NEXT
1400 IF DISPLAY=0THENDISPLAY=1:CLS:TL(PL)=0:GOTO210
1410 '*******RESET DICE COUNT***
1420 FOR ND=1TO5:LETSI(ND)=0:LETSA(ND)=0:NEXTND
1430 '***RESET NUMBER COUNT****
1440 FOR R=1TO6:N(R)=0:NEXT
1450 '*****RESET SAVE DICE*****
1460 FOR A=1TO5:SA(A)=0:NEXT
1470 '***RESET TOTAL***
1480 LET TL(PL)=0:LETSF=0
1490 '*******GO COUNTER********
1500 CLS3:IF GT(PL)>13THENGOTO1510ELSENEXT PL:GOTO170
1510 '********FINISH***********
1520 FORA=1TO6:LET FINISH=FINISH+SC(A,(PL)):NEXT A
1530 IF FINISH=>63THEN FINISH=FINISH+35
1540 FORB=7TO13:LET FINISH=FINISH+SC(B,(PL)):NEXT B
1550 CLS7:PRINT@160," ";A$(PL);" YOU HAVE NO GOES LEFT.":PRINT"      YOU SCORED "
;FINISH
1560 PLAY"T15;L4;V15;O3;AE;ADEGFBCADEFGBADE":FOR PAUSE=1TO2000:NEXT
1570 CLS6:LET FINISH=0
1580 NEXT PL:GOTO170
```

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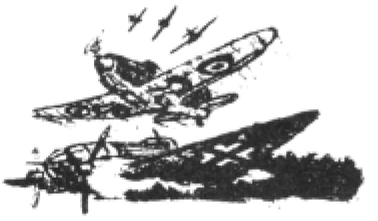
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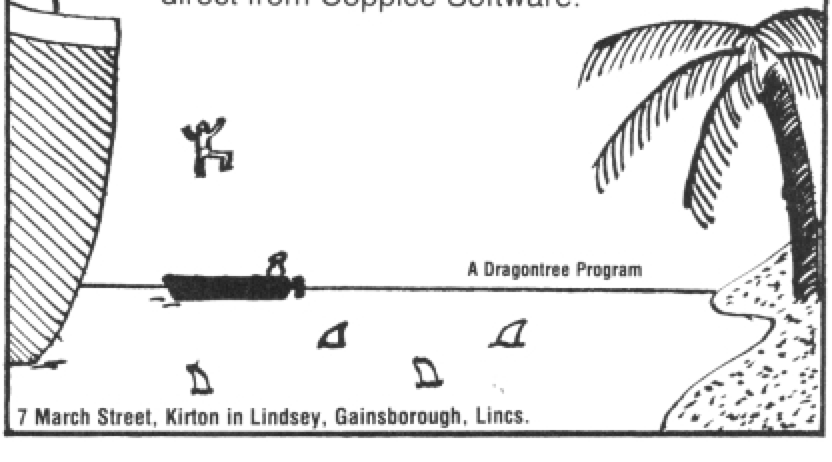
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If you've got a technical question or problem write to Cathy Hyde, Dragon Answers, *Dragon User*, 12/13 Little Newport Street, London WC2R 3LD.

Dragon Answers



Tip for a beginner

I PURCHASED a Dragon 32 last month. I have no computer knowledge other than that I have picked up since then.

The question I wish to ask concerns the memory of the Dragon 32. When I enter PRINT MEM, I get the display of "24871" bytes. Should this not be 32768 if 1k = 1024 bytes.

I have tried this function several times and always get back the same display. I have made sure that there is no program in the computer before calling up the memory. I have also tried to switch off the computer for about 10 seconds before calling up the memory.

As I stated this is my first computer and I have little knowledge so far of all the various functions. In the circumstances would you please be so kind as to let me know if the computer is functioning as it should, or do I have a defect?

D E Pountney, Bexleyheath, Kent.

THE DRAGON 32, as advertised, does have 32K of dynamic RAM. However, some of this memory is taken up by graphics pages, etc. The breakdown is as follows: 1K for cassette buffers and Basic pointers; ½K taken by text screen; 200 bytes for string storage; and 17 bytes — stack.

The maximum memory available to users if you do not need graphics pages is 31015 bytes. To obtain this enter the following POKE:

POKE 25,6
POKE &H600,0

Then type NEW and you will have 31015 bytes available.

POKE problems

IN YOUR reply to the letter from B Hayton (May) about POKEing 65495,0 you say you do not recommend this POKE as it makes the Dragon work out of design specification, but on page 43 of that issue there is a program with the same POKE. On one hand you don't recommend it, but on the other you do.

I am asking you this as my machine also seems to crash at this speed. I also purchased a flight simulator program with the line POKE &HFFD7,0 which does the same thing and that also seems to go wrong after a while.

Please could you say whether my Dragon is faulty. This is my second machine (the first had a fault), and if it is faulty then I would like to get something done about it before the guarantee runs out.

I L Jennings, Cambridge.

NUMEROUS OTHER readers have written in asking about the POKE 65495,0 or its hexadecimal equivalent POKE &HFFD7. The Dragon 32 has been designed to run at a certain speed, ie 0.89 MHz, and this POKE causes it to run at double speed, therefore the machine is running out of specification and may crash.

If your machine does crash it is not faulty, it is still performing to its advertised specification, but no further.

Any readers aggrieved that their Dragons will not accept the speed-up POKE should consider that improvements to guarantee a faster level of performance would increase costs and still lead to users discovering other ways of increasing speed. Again these discoveries would be unlikely to apply to all machines.

The POKE does work on a number of Dragon 32s which is the reason it is included in listings in this magazine. Software houses, however, are misleading users if they do not mention that their programs contain the POKE. Such programs cannot be guaranteed to work on all machines.

The POKE is unlikely to damage your machine but I'm afraid no research has yet been done on this subject.

Auto-run on Dragon

I WOULD like to know if it is possible to make programs, which I have keyed in, auto-run upon loading.

I know how to do this on two other computers but it is not mentioned in the Dragon manual.

Paul Rodriguez, Leamington Spa, Warwickshire.

THERE IS no simple way to make Basic programs auto-run on loading as there is no facility for this inbuilt in the Basic used on the Dragon.

However, it should be possible to obtain auto-run using machine code. One method of achieving this is to save a "dummy" program, containing a jump to CLOADM or similar, previous to the program you wish to auto-run.

When this "dummy" program loads it overlays the interrupt sectors and control is then transferred to the jump routine so that the program following will load and execute automatically.

Crystal change

IN DRAGON User of June 1983 an article comparing the Dragon 32 and the Tandy Colour Computer mentioned that the external oscillator of the early Dragons was run at 14.31818 MHz but that in later machines this had been changed to 14.218 MHz "to improve picture quality".

Could you tell me into which category my Dragon falls and, if of the earlier design, is it possible to change the crystal, what is the exact frequency of the new crystal and is it possible to do this at home (once out of guarantee)? I have some electronics experience.

My Dragon was bought from the Swansea factory on August 16 1982 and its serial number is 009327 DG.

Simon Mee, Aberystwyth Dyfed.

IT IS not possible to tell from a serial number what exact configuration you have inside your machine as serial numbers do not necessarily run consecutively.

The crystal change mentioned in an earlier issue of this magazine does not necessarily improve the quality of the display and it would not be worthwhile carrying out the alteration as it would invalidate the warranty with no guarantee of improved display.

Club information

SOME SIX to seven weeks ago I returned the guarantee card which was part of the package of my Dragon 32 computer. Since returning the guarantee card I have heard nothing. As I believed that I was entitled to one year's free membership of the Dragon users club I expected to receive, at the very least, confirmation of my membership.

Could you please, therefore, either send me any information from the club or inform me that I was under a misapprehension about membership becoming automatic on return of the guarantee card?

L Tollitt, Warrington.

I HAVE had quite a few inquiries about the Dragon newsletter directed to *Dragon User* and I should like to take this opportunity to point out that *Dragon User* is an independent magazine and is not connected in any way with Dragon Data's official newsletter *Stop Press*.

***Stop Press* is released approximately every six weeks and the mailing list updated before each release. Therefore, if your warranty card is returned about the same time as a *Stop Press* release your details will not go onto the mailing list until just previous to the next issue.**

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Answers to Competition Corner, *Dragon User,* 12/13 Little Newport Street, London WC2R 3LD

Win a Supertalker – on a roll of the dice!

Test your skill – or your luck – on this puzzle by Gordon Lee.

Prizes

THIS MONTH'S PRIZE is a speech synthesis package consisting of the Namal Supertalker from DRG Business Machines and an RS232 interface from Cotswold Computers. The Supertalker has an onboard EPROM containing over 550 commonly used words, including many suffixes and prefixes, allowing over 2,000 different words to be made. A further 2K of RAM is available to the user to extend the onboard dictionary by 200-250 words. The Supertalker can also be programmed directly using phonemes.

The RS232 interface is needed to connect your Dragon to the Supertalker. The interface is designed to allow the Dragon to transmit and receive any data from RS232 compatible devices. It uses the standard 25-way D-type connection, incorporating additional lines to allow control of modems for transmitting data and text over the telephone network.

Rules

TO WIN THE Supertalker plus RS232 interface, you have to send in the most elegant solution to the puzzle. You must show both the answer to the competition and how to solve it with the use of a Basic program developed on your Dragon 32.

As a tie-breaker, complete the following sentence in 15 words or less:

I want to add speech synthesis to my Dragon 32 in order to ....

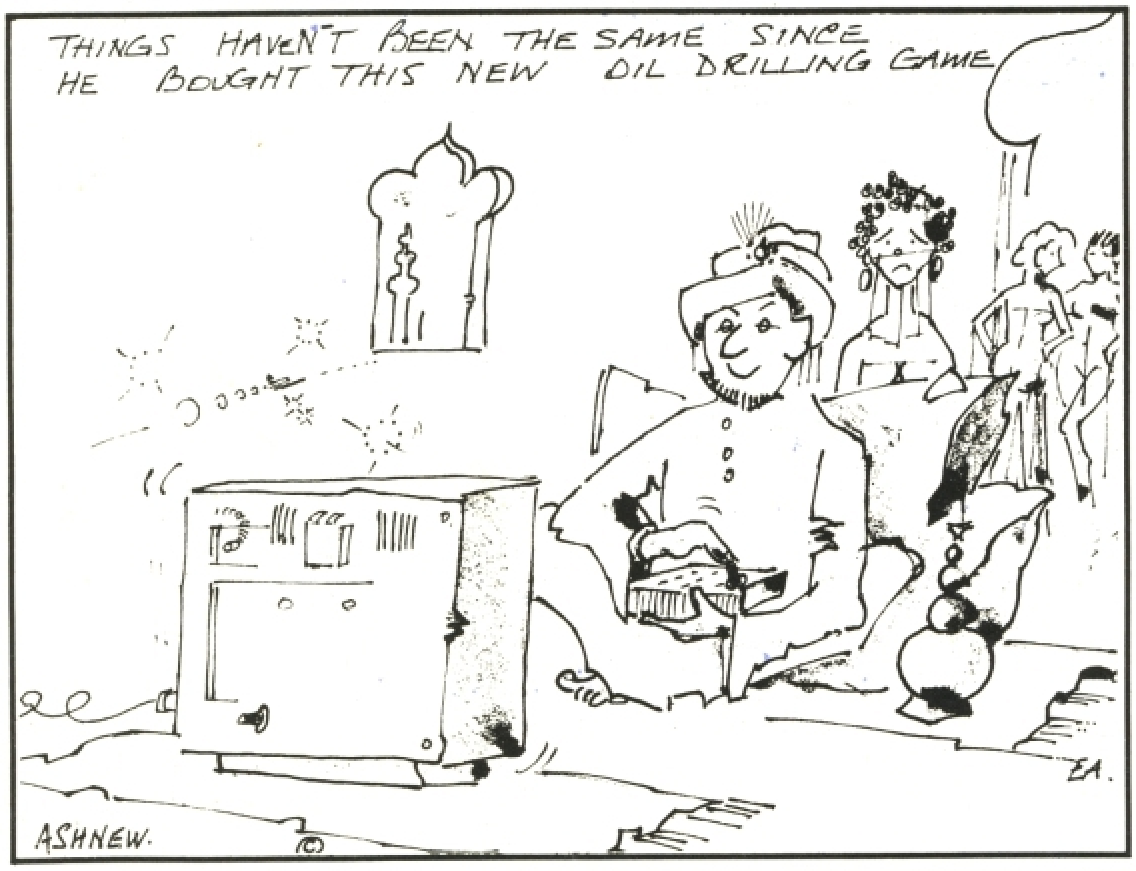
....

....

Your entry must arrive at *Dragon User* by the last working day in September 1983. The name of the winner, and the solution to the puzzle, will be printed in the November issue of *Dragon User.* You may only enter the competition once. Entries will not be acknowledged and we cannot enter into correspondence on the final result. Please send your entries to *Dragon User,* 12/13 Little Newport Street, London WC2R 3LD.

July winner

THE WINNER OF the July competition is Roger Leitch of Faringdon in Oxfordshire who will be receiving his prize of a Micrograsp robot from Powertran Electronics. The answer is that *DRAGON USER* is represented by the numbers 760384 and 1296.



OF THE FIVE 'Platonic' solids, probably the most familiar is the cube. Certainly its use in everyday life is far greater than any of the others, no doubt due, in part, to the cube being the only one of the Platonic solids that has faces that are both square, and also arranged at right-angles to each other.

Space doesn't permit consideration of the other four Platonic solids except to mention them. They are the tetrahedron, octahedron, and icosahedron (with, respectively, four, eight and twenty faces — each of the faces being an equilateral triangle), and the dodecahedron, which has 10 faces — each face a regular pentagon.

Returning to the cube, we shall say little more concerning its geometry, save that its shape makes it the obvious choice for a die. It is a regular solid — so each face will have an equal chance of ending uppermost, and also it has just about the right amount of "rollability". The tetrahedron, for example, is too acute to roll well, whereas the icosahedron would roll almost as well as a ball — no doubt, during a game using dice of this type, more time would be spent retrieving them from under the table than actually playing.

Dice tricks

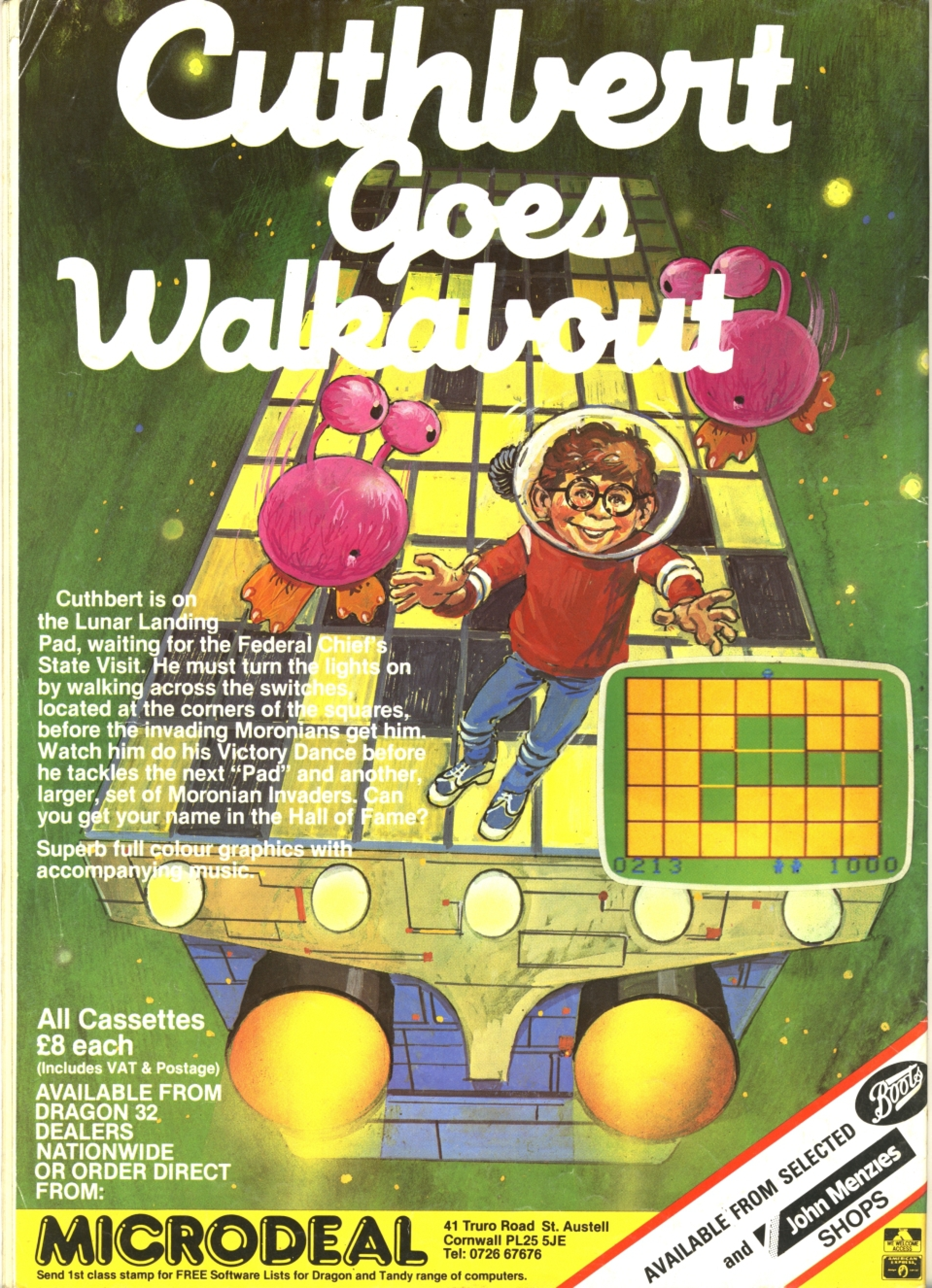
It is certain aspects of dice that I shall be considering here. First, here's a trick with three dice. Hand them to a friend, turn your back, and ask him to throw them on to the table. He is then to double the number of the first die and add 5, multiply this by 5 and add the value of the second die.

Finally, ask him to multiply the total by 10 and add the number on the third die. You ask him for the total and you are instantly able to give him the values on the dice. How? Simply subtract 250 from the total that he gives you and this will give you the answer.

A little problem concerning dice arose recently when I tried an experiment with Sam and Paul, two mathematician friends. Earlier, I had thrown three ordinary dice and had noted the scores.

I explained what I had done, and I gave them each a piece of paper, and announced that on Sam's paper I had written the *sum* of the numbers thrown, while on Paul's I had written the *product.* I added that they should keep these values secret from each other.

They both made many calculations but neither seemed able to make any headway. Then Paul said: "I can narrow it down to one of two possible sets of dice throws." There was another silence and then Sam declared: "I had reduced it to three possibilities, but now I can eliminate all but the correct answer." He was right too. **What were the values that I had thrown with the three dice?**


Cuthbert Goes Walkabout
Cuthbert is on the Lunar Landing Pad, waiting for the Federal Chief's State Visit. He must turn the lights on by walking across the switches, located at the corners of the squares, before the invading Moronians get him. Watch him do his Victory Dance before he tackles the next "Pad" and another, larger, set of Moronian Invaders. Can you get your name in the Hall of Fame?
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